POST EARNINGS ANNOUNCEMENT DRIFT AND STOCK LIQUIDITY IN THE US, THE UK AND FRENCH EQUITY MARKETS

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ABSTRACT

This thesis aims to investigate the influence of earnings news on stock liquidity and the relationship between information asymmetry cost component and Post Earnings Announcement Drift in different equity markets. The scope of this research includes 1821 firms from three leading countries in capital trading, the United States, United Kingdom, and France. The first part of empirical work, the univariate panel analysis, shows that price reaction, volume response and liquidity effect are profound during short term event window length and reduce over time when the news ceases, The second part, a multivariate regression analysis which uses Generalised Method of Movement to capture both the problems of a likely presence of endogeneity between the explanatory variables and cross-stock heterogeneity,shows that the impact of earnings announcement on stock liquidity can split in two directions. The immediate effect is the shock after the news, causing stock liquidity to decrease immediately by lifting the illiquidity function upward. After the event, from the new increased position of illiquidity function, stock liquidity improves over time due to the trading volume increases and shifts the slope of illiquidity function downward. The overall effects at a point of time will be the total impact of the two side effects. And as shown in the results, the overall impact on the US and UK markets are that stock liquidity decreases and that on Euronext Paris the stock liquidity increases. Given that in accounting there are two types of systems of which common law system includes the US, UK and others, and code law system includes France and the rest, the above results could suggest the difference between the two systems is that the information asymmetry component dominates the bid-ask spread in common law countries as in the US and UK markets while the cost of trading dominates the bid-ask spreads in code law countries such as France. Finally, it is shown that there are several determinants of the PEAD, of which stock liquidity is one. Earnings news changes the stock liquidity, and therefore stock liquidity plays a role in the market response. When earnings news is released, it initially creates a gap between the informed traders and the uninformed traders, increasing the bid ask spread. Over time, this information gap decreases, however in the meantime more information on the market increases trading volume and reduces trading cost, leading to another part of the bid ask spread decreasing or stock liquidity improving. After decomposing bid ask spread into information asymmetry cost and cost of trading components, the final part of empirical analysis shows that information asymmetry cost component provides a partial explanation for PEAD in the London Stock Exchange and Euronext Paris.

Table of contents

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

INTRODUCTION

Post Earnings Announcements Drift (hereafter PEAD) is the tendency for a stock's cumulative abnormal return to drift in the direction of an earnings surprise for the time following an earnings announcement. PEAD existence challenges both Capital Asset Pricing Models and Efficient Market Hypothesis, as under the assumptions of these theories PEAD cannot occur. In an efficient market, stock prices reflect all available and relevant information, hence adjust immediately to earnings news rather than continue to drift in the direction of earnings surprises up to several months after earnings news. In Capital Asset Pricing Models (hereafter CAPM), stock prices follow a random walk in a predictable manner while the PEAD is drifted apart from CAPM models. Since first recognised by Ball R. and Brown in 1968, PEAD existence has been confirmed for the last four decades by a large number of academic authors. Analysts' under-reaction to earnings surprises, biased information processing, deficiency of CAPM and trading risk may all contribute to the reason for PEAD. Although, there has not existed a full explanation as to why, the debate is still going on and the reason for PEAD remains hidden.

During the earlier period, most studies believe that under reaction is the main cause for PEAD. Analysts under-react, and investors who are advised by analysts were said to be not confident about the information, therefore they gradually adjust stock prices even after earnings announcements. This argument is consistent with studies from Jones and Litzenberger (1970), Bernard and Thomas (1989), Albarbanell and Bernard (1992), Freeman and Tse (1989), Bhushan (1994).

Information biased processing is another form of under reaction. In other words it is the market's inefficiency in processing earnings information. Some people in the past believed that PEAD effect is due to a methodological limitation or measurement error. Lee (1992) provides evidence on the conjecture between the PEAD and the extent to which sophisticated investors can limit the mispricing. Even in a recent study, Asthana Sharad (2003) proves that PEAD declined with the growth of information technology.

On the other hand, other studies point out that PEAD in fact occurs due to the deficient CAPM regardless of investors' behaviour. This argument is consistent in Ball (1978), Foster, Olsen, and Shelvin (1984). According to Ball (1978), the two-parameter model when applied to a portfolio of common stocks, mis-specify the process of generating securities yield. He stated that CAPM omits one or more variables. Later on, in Foster et al (1984), their tests results are consistent with CAPM mis-specify and reject the possibility of an interference of information market or time period explanation.

Most previous studies in literature assume that liquidity risk is constant during the period of earnings announcement. However, this is now being questioned. Bhushan is the first to *indirectly* link the stock liquidity and the PEAD by suggesting a transaction cost explanation for PEAD. Over the last several years, examination on the PEAD developed a new direction for empirical analysis, questioning the impact of liquidity risk on the PEAD. Following Bhushan and Mendenhall (2004), Hou and Moskowitz (2005) and Brav and Heaton (2006), however, none of them study directly the relationship between PEAD and transaction cost. To the best of my knowledge, only several papers study in detail the relationship between PEAD and stock liquidity; they are: Sadka (2006), Batalio and Mendenhall (2007), Ng, Rusticus and Verdi (2008) and Chordia et al (2009). Among these papers, Sadka (2006) uses *price impact* to proxy liquidity and decompose it into fixed and variable price effects; Chordia et al (2009) related *Amihud illiquidity ratio* and *standardised zero trading volume day* with the PEAD, Batalio and Mendenhall (2007) study the implication of *quote bid ask spread,* finally, Ng et al (2008) study the implication *of transaction cost (bid ask spread and commission)* to the PEAD. The major drawback from Chordia et al (2009) is that they exclude illiquid stocks lower than $5 and requiring stocks with at least 10 day trading each month. This is problematic because it is very well-known that infrequently traded stocks drive liquidity premium, which creates bias in results. The major drawback from Batalio et al (2007) and Ng et al (2008) is that they use bid ask spread or bid ask spread and commission as direct estimates of transaction costs, ignoring the information factor of earnings announcement. In fact, none of those studies use data other than US data; none of those studies include an information based factor, and they mainly focus on the transaction cost rather than liquidity itself.

Liquidity effect in fact is a type of risk misspecification. The higher the liquidity the lower is the risk. Using different measurements of liquidity these studies developed a theory that liquidity could be an explanation of PEAD. However, very few studies directly point out which liquidity factor plays the main role. In addition, different measurements of liquidity were used, providing inconclusive conclusions.

In sum, there have been too many studies into the cause of PEAD, but very little focus on the relationship between PEAD and liquidity. Amongst these, not much has been solved at a general satisfaction of all concerned.

In this thesis I want to address another issue: the use of bid ask spread to proxy stock liquidity then explore the relationship between stock liquidity and the PEAD. Moreover, I also want to study in particular the influence of information asymmetry cost component of bid ask spread on the impact of the event. Lastly, this thesis makes a cross -country comparison and a comparison between two different accounting systems; code law system where the earnings information is released 3 to 4 weeks before earnings announcement day through different channels, and common law system, where the earnings information is released only on the earnings announcement day.

The starting point of my thesis is motivated by Kim and Verrecchia (1994) suggestion of a theoretical model that information asymmetry increases around earnings announcement due to the superior information between informed traders over the market makers. This suggestion has led me to believe that there is a relationship between bid ask spread, especially the information asymmetry component in spread and the PEAD, it motivates me to further explore the issue by a new route. In empirical tests on the London Stock Exchanges, the US Stock Exchanges and Paris Bourse, my thesis provides another view on the way to measure liquidity and information component that could drive the movement of prices: Bid Ask Spread, by three different measures.

The scope of this research includes 1821 firms from three leading countries in capital trading, the United States, the United Kingdom, and France. In the UK, this research includes most of the firms listed on the London Stock Exchange, which are 99 large firms by market capitalisation in FTSE100, 233 medium firms in FTSE250, 310 small firms in FTSE Small Cap, and 913 small firms in alternative investment market index FTSE AIM ALL SHARES, given a final sample of 1555 firms across the UK. In the United States, this research includes the 30 largest and most widely held public companies over the country in the DJIA; 96 largest domestic and international non-financial securities listed on the NASDAQ Stock Market in NASDAQ100, which reflects companies across the major industry groups including computer hardware/software, telecommunications, retail/wholesale trade and biotechnology; and 100 leading U.S. stocks with exchange-listed options in the S&P100, which are selected for sector balance and represent about 57% of the market capitalisation of the S&P 500 and almost 45% of the market capitalisation of the U.S. equity markets, given a final sample of 226 firms across the U.S. markets. Finally, in France, this thesis covers the 40 largest and most liquid stocks trading on the Paris Bourse (now the Euronext Paris) in the CAC40.

In the empirical analysis part of this thesis, chapter IV and V explore the impact of earnings announcement on stock market liquidity. Consistent with previous literature, the initial part of chapter IV reports significant positive (negative) price reactions after earnings announcement across all exchanges, corresponding to good (or bad) news. The results from trading volume effect analysis also show that trading volume increases dramatically during the event for all examined indices. The results from the latter part of chapter IV show that stock liquidity, which is measured by three different terms-quote bid ask spread, relative bid ask spread, and effective bid ask spread, decreases due to the impact of earnings announcements in the US and UK markets, but increases due to earnings announcements on the Euronext Paris. Given that in accounting there are two types of countries of which common law system includes the US, UK and others, and code law system includes France and the rest; the above result could suggest the difference between code law and common law systems is that the information asymmetry component dominates the bid-ask spread in common law countries as in the US and UK markets while the cost of trading dominates the bid-ask spreads in code law countries such as France.

Another point to note from the results in chapter IV is that: although stock liquidity decreased (or increased) in the US and UK stock markets (or Euronext Paris) compared to the pre earnings announcement period, in the post earnings announcement period stock liquidity increased over time in both types of countries.

The multi-variate analysis in chapter V provides some more insights to the above issues. More variables were added to explain the changes in stock market liquidity using Generalised Method of Movement, which can capture the problems of likely presence of endogeneity between the explanatory variables and cross-stock heterogeneity. Trading volume, stock price, and stock volatility which are proxied by moving standard deviation of stock return, are all found to account for the explanation of stock liquidity variation around earnings announcements. The impact of earnings announcement on stock liquidity can split in two directions. The immediate effect is the shock after the news, causing stock liquidity to decrease immediately by lifting the illiquidity function upward. After the event, from the initial increased position of illiquidity function, stock liquidity improves over time due to the trading volume increases, shifting the slope of illiquidity function downward. The overall effect at a point of time will be the total impact of the two side effects. And as shown in chapter IV, the overall impact on the US and the UK markets is that stock liquidity decreases and on the Euronext Paris the stock liquidity increases.

Chapter VI investigates the source of the change in stock liquildity associated with post earnings announcement drift. It aims to examine the effects of total bid ask spread, which proxied for stock liquidity, and particularly the information asymmetry component cost on the post earnings announcements drift to work out the influence of news. Moreover, this chapter performs bid ask spread decomposition into information asymmetry cost and cost of trading components and investigates the relationship between information asymmetry component of Bid-Ask Spread and Post earnings announcement drift. The results from this chapter prove that information asymmetry components are significantly related to post earnings announcement drift for firms in the London Stock Exchange and Euronext Paris.

The results however are not significantly related to the response in the US markets, partly because of the noise in the unexpected earnings measurement on the event in this market. While news on the London Stock Exchange are released at market open, in the US, a number of companies release earnings news at market open while others release the earnings news at market close.

In concluding, chapter VII summarises the findings and remarks. Earnings news changes the stock liquidity, and therefore stock liquidity plays a role in the market response. When earnings news is released, it initially creates a gap between informed traders and uninformed traders, increasing the bid ask spread and reduces stock liquidity. Over time, this information gap decreases, however in the meantime more information on the market also increases trading volume and reduces trading cost, leading to another part of the bid ask spread decreasing or stock liquidity improving. After decomposing bid ask spread into information asymmetry cost and cost of trading components, the empirical analysis shows that information asymmetry cost component provides a partial explanation for PEAD in the London Stock Exchange and Euronext Paris.

A further study is suggested for the US market that has a more specific time for the earnings news released on the day.

Summary findings and contributions from thesis:

A- Contributions

1) The first contribution of this thesis is to include large, medium, and small firms in the UK. My sample covers all of the stocks that have data available and traded in the London Stock Exchange main Market and FTSE AIM All Shares[1]. This is interesting because this thesis examines not only the highly liquid stocks but also the less liquid and illiquid stocks. Among those papers study the impacts of earnings announcement on stock liquidity (proxied by bid ask spread), Gregoriou (OBES, Forthcoming, 2009) and Acker et al (2002) investigate only large /medium companies (FTSE100 and FTSE 250) in London Stock Exchange. Krinsky and Lee (1996) study on an old data set in NYSE with stock price of at least $3 on average during the sample period. Even though, those papers have not linked bid ask spread with PEAD. Two papers that studied the direct relationship between PEAD and bid ask spread are: Batalio and Mendenhall (2007) and Ng et al (2008). Both use NYSE and AMEX data and focus on the change in transaction cost, proxied by bid ask spread or bid ask spread and comission, as a possible cause of PEAD but

[1] A sub-market of the London Stock Exchange, allowing smaller companies to float shares with a more flexible regulatory system than is applicable to the Main Market.

ignore the liquidity dimension. Moreover, these two papers have not pointed out the specific component in bid ask spread which associated with the change in the PEAD.

2) This research is the first study covering the CAC40 in France, a market that employs the code law system[2]. This allows a comparison of two different accounting systems which are code law and common law, where in the code law countries the earnings information is released 3 to 4 weeks before the formal earnings announcement date, through different channels and where in the common law countries the earnings information is released just on the earnings announcement day itself.

3) Finally, earnings announcements creates the gap between informed and uninformed traders, therefore one of its impacts is to increase the bid ask spread. The most important aspect of this thesis is the innovation as it analyses not only the influence of earnings news on stock liquidity, but also investigates the determinant of information asymmetry factor of earnings announcement to the PEAD.

B- Findings

1) Consistent with previous studies, this research on different markets with a relatively large sample reports that positive (negative) price reactions are significant after earnings announcements across all exchanges corresponding to good (bad) news firms. I used the standard event methodology with the use of market adjusted model following Brown and Warner (1985) which is subsequently used by many previous researches on event studies (see Hedge and McDermott (2003), Denis et al, (2003), Gregoriou and Ioannidis (2006). Within a 181 trading day period around the date of earnings announcement, other points to notice are: i) in most of the cases, the impact of good news last longer while the impact of bad news end quickly, the exception being the 100 high tech firms on the US (NASDAQ100), ii) In France, a code law country, there is evidence of pre-earnings announcement reaction for the positive news firms while no pre-earnings announcement reaction for negative news. The price reactions end quicker than in common law markets. iii) Overall reaction reaches its peak on the announcement day, whether it is in the common law

[2] Voetmann, T. (2001) studies the impact of earnings announcement on stock liquidity in Copenhagen stock exchange, however, this is a working paper and has not been published yet.

country where earnings information is kept secret until the announcement is made, or it is the code law country where information is conveyed and circulated to the markets through multiple channels up to 3 to 4 weeks before official announcement date.

2) To extend the uni-variate analysis, trading volume effects analysis of earnings announcement show that trading volume increases dramatically during the event for all the examined indices. The strongest reaction happens on day 0 in the UK market while on day 1 for some indices in the US market. Note that in the UK all of the news is released in the morning of the announcement date, whilst in the US market many firms tend to release the earnings news after market close. In the long term, trading volume effects show that investors tend to follow large and liquid stocks. This reflects the situation of "herding". When there is news, investors react, they trade more with both liquid and illiquid stocks; when the news ends, there are fewer investors who follow less liquid or illiquid stocks.

3) Applying the information cost liquidity hypothesis, the results show that in the US and UK markets, stock liquidity (which is measured by three different terms-quote bid ask spread, relative bid ask spread, and effective bid ask spread), decreases due to the impact of earnings announcements but in the Euronext Paris it increases due to earnings announcements. Given that in accounting there are two types of systems of which common law includes the US, UK and others, and code law includes France and the rest; the above result could suggest the difference between the two systems is that the information asymmetry component dominates the bid-ask spread in the common law system as in the US and UK markets while cost of trading dominates the bid-ask spreads in code law countries as in France. Another point to consider is, even though stock liquidity decreases in the US and UK and increases in Euronext Paris initially after earnings announcement, it increases over time in both systems during the post earnings announcement period.

4) To control for all factors such as stock price, trading volume and volatility, my multi-variate analysis provides some more insights on the above issues. All of the variables in the univariate analysis in chapter V are incorporated in one model to explain the change in stock market liquidity using Generalized Method of Movement that can overcome the problems of endogeneity and

cross-stock heterogeneity. The results show that, trading volume, stock price and stock volatility, (which is proxied by moving standard deviation of stock return), all account for the explanation of stock liquidity. In addition, the stock liquidity initially suffers a permanent shock after the news is released, the impact being a downside after which it increases over time by the interaction of trading volume changes. In particular, the impact of earnings announcement on stock liquidity could split in two opposite effects. The immediate effect is the shock after the news, causes the stock liquidity to decrease immediately by lifting the illiquidity (bid-ask spread) function upward. After the event, from the initial increased position of illiquidity function, stock liquidity improves over time due to the trading volume increase, shifting the slope of illiquidity function (bid ask spread) downward. The overall effects at a point of time will be the total impacts of two side effects. And as shown in chapter IV, the overall impact on the US and the UK markets is stock liquidity decrease and on the Euronext Paris is stock liquidity increase.

5) Finally, I have proved that information asymmetry components are significantly related to PEAD for firms in London Stock Exchange and Euronext Paris. The information asymmetry cost however is not significantly related to the market response in the US markets, part of the reason might be due to the noise in the unexpected earnings measurement on the event in this market. While news on London Stock Exchange are released at market opening, in the US, a number of companies release earnings news at market open while other companies release the earnings news at market close.

Who can be potential beneficiaries?

There are four categories of potential beneficiaries from this research:

- Any the researcher who study behavioural finance and microstructure of financial markets can be a beneficiary. The outcome of this research provides an incentive so that they can explore and further develope their studies into the relationship between bid ask spread and PEAD.
- Any financial analyst involves in market microstructure and stock performace analysis can be a beneficiary. This research provides more empirical and theoretical insight into the formulation and development of their earnings and

pricing models. They can account the bid ask spread and information asymmetry as factors that can affect stock price and returns behaviours. In addition, from my research, analysts will be able to determine the difference in the pattern of returns /market liquidity behaviour between small and large companies; they can anticipate the above impact being different between large and small sized companies.

- Any investor or student who wants to gain a better understanding and to further enhance their expertise in this subject matter can do so from this research.
- International accounting bodies can also be beneficiaries from this research for their institutional interests. Contribute to existing literature; this research demonstrates that PEAD means information disclosure is inadequate. In other words, markets do not fully understand information when information is released. PEAD means that markets need long time to digest disclosures. In such situation, there are two questions to be raised: (i) Are accounting numbers such as earnings information really meaningful? (ii) Is the current method of disclosures appropriate? Perhaps we need a standard format for narrative disclosure. Further understanding about the above three issues can help the International Accounting bodies to setup more appropriate accounting standards.

The layout of this thesis is organised as follows. Chapter II discusses a literature review on PEAD, the explanations for it, and the relationship between PEAD and stock liquidity, particularly with stock liquidity measured by bid ask spread and why I use bid ask spread to proxy stock liquidity. Chapter III performs a general task to describe the sample coverage, data selection process, variables and methodology approach used in this study. Chapter IV conducts different uni-variate analysis that includes price response impact, trading volume effect on stock liquidity and application of information cost liquidity hypothesis. Chapter V incorporates the different impacts of earnings announcement in the previous chapter in a multi-variate analysis to explore the impact of earnings announcements on the stock market liquidity. Chapter VI explores the determinants of the market response to earnings announcements, of which stock liquidity is the focus. Furthermore, this chapter performs bid ask spread decomposition into information asymmetry and cost of trading components, it also investigates the relationship between information asymmetry component of Bid-Ask Spread and Post earnings announcement drift. In conclusion, Chapter VII summarises the findings and put forwards recommendations for further research.

CHAPTER II

LITERATURE REVIEW OF PEAD AND THE EXPLANATIONS FOR IT

The persistence of PEAD involves numerous studies since it was first reported by Ball and Brown (1968). The main focus of available literature on earnings announcement has been on the response of investors to new earnings information. In the market efficiency hypothesis, the available information at the time t should be reflected in stock prices immediately. The investor's expectation of tomorrow prices is today's price plus a small risk premium, because they cannot forecast the direction of the market. However PEAD is an anomaly that is inconsistent with market proficiency. PEAD were reported from market efficiency tests, where it looks like, after controlling for risk, it was still possible to earn an abnormally high return. Stocks with high earning surprise have high abnormal return and more surprisingly, stocks with positive surprise continue to grow while stocks with negative surprise continue to decline. What can an investor do to trade on PEAD? He can exploit this phenomenon by buying stock with highest earning surprise and short stocks with lowest negative surprise to maximise the drift. This explains the question of the role of PEAD and why PEAD is important to investors as well as researchers. The remaining questions for researchers are: What is the importance of the appropriate benchmark model? What are the effects in the short term and long term and what do the effects look like? What are the reasons behind all these?

The purpose of this chapter is to review and discuss the literature on the Post Earnings Announcements Drift and the link with my thesis. It provides the general perception of PEAD and reviews the documented evidence of this phenomenon based on different benchmark models and methodologies. It also summarises and classifies the possible explanations for PEAD. On top of that, I want to raise the possibility of using liquidity risk by bid ask spread, to explain the PEAD, so the relevant liquidity measures and the associated studies will be discussed and criticized.

The outlay of this chapter is organized as follows: The following section provides the definition of PEAD. Section 2.2 to 2.4 reviews related theories, the methodology to explore the PEAD and the reported evidence of PEAD in the literature. All the possible explanations for PEAD are summarized in Section 2.5, of which subsection 2.5.2 discusses the literature with respect to liquidity risk. Section 2.6 summarises the possible measurements of stock liquidity, shortcomings and advantages of each measurement and why this thesis chooses bid ask spread to proxy for stock liquidity. Section 2.7 discusses the literature of stock liquidity in relation to earnings announcement and PEAD. Finally, Section 2.8 gives a brief summary.

2. 1. Definition of PEAD

The efficient market hypothesis states that price should contain all the information available to the market. Once new information is available, it will be totally reflected in the adjustment of price. But studies show the fact that after earnings announcement, abnormal returns of good news firms continues to drift up in positive direction meanwhile abnormal returns of bad news firms continue to drift in the opposite direction. Initially the prices react to information on a large scale, but this reaction does not complete after the news, it continues to drift dependent on the direction of the news in months after.

The survival of this phenomenon has been confirmed for the last four decades since the work of Ball and Brown (1968), and is named Post Earnings Announcement Drift. This phenomenon has not only been confirmed in the US for many years following Ball and Brown, but also in the UK in the studies by Hew, Skerratt, Strong and Walker (1996); Liu and Strong (2003), in the emerging Finnish stock market by Booth et al (1997), Hannu J. Schadewitz; Antti J. Kanto; Hannu A. Kahra; Dallas R. Blevins (2005) …. So far there have been quite a lot of attempts to solve the question of what causes the Post Earnings Announcement Drift. The possible explanations are analysts'/investors under-reactions to earnings surprises, information biased processing, deficient asset pricing model, and misspecification of risk still remain controversial and unclear.

2.2. Measures of Earnings Surprise and detect PEAD in the literature

Three main measures of earnings surprise have been proposed in the literature to quantify new information in earnings and measure the PEAD. Some researchers use a single method while the others use all of the three methods to detect the PEAD and the explanations for it.

2.2.1 Earning-based measure: Standardized Unexpected Earnings

This measurement uses standardized unexpected earnings (SUE) to measure earning surprise. SUE is calculated as unexpected earnings divided by standard deviation of the unexpected earnings pre earnings announcement period.

$$SUE_{it} = \frac{UE_{it}}{\sigma(UE_{it})} = \frac{e_{it} - E[e_{it}]}{\sigma(e_{it} - E[e_{it}])} \quad (2.2.1.1)$$

Where

SUE_{it} = quarter *t* standardised unexpected earnings of stock i

e_{it} = quarter *t* actual earnings per share reported by the firm i

$E[e_{it}]$ = quarter *t* expected value of e_{it}

$\sigma(e_{it} - E[e_{it}])$ = quarter *t* standard deviation of unexpected earnings

This methodology is used by Bidwell (1979), Bernard and Thomas (1989), (1990); and Chan et al (1996). Base on the way it is calculated, SUE is earnings surprise over an extended period. However, the shortcoming of this measure is that SUE involves uni-variate time series earnings forecasting models, which may neglect other variables that could be meaningful in the explanation process.

Three influential models used to calculate $E[e_{it}]$ are Brown and Rozeff uni-variate time series model of quarterly accounting earnings per share, Foster's (1977) first order autoregressive earning expectation model, and the naïve random walk model.

i) the naïve random walk model

The naïve seasonal random walk model is simple as follows

$$E[e_{it}] = \delta + e_{it-4} \quad (2.2.1.2)$$

Where

$E[e_{it}]$ is expected earnings of stock i at quarter t

δ is the drift term

$e_{i,t-4}$ is actual earnings at quarter t-4

ii) Foster's (1977) first order autoregressive earning expectation model

$$E[e_{it}] = \delta + e_{i,t-4} + \varphi\left(e_{i,t-1} - e_{i,t-5}\right) \quad (2.2.1.3)$$

Notation is the same as above model.

$\varphi\left(e_{i,t-1} - e_{i,t-5}\right)$ is the first –order autoregressive term that account for the positive but decaying autocorrelations in seasonally-differenced earnings

iii) Brown-Rozeff (1979) univariate time series model of quarterly accounting earnings per share.

The Brown-Rozeff earnings expectation from this model is expressed as follows

$$E[e_{it}] = \delta + e_{i,t-4} + \varphi\left(e_{i,t-1} - e_{i,t-5}\right) + \theta\varepsilon_{i,t-4} \quad (2.2.1.4)$$

$\theta\varepsilon_{i,t-4}$ is a seasonal moving average term at the four lag to account for the observed negative correlation in year to year seasonally-differenced earnings.

As mentioned above, univariate time series model might omit other important information. A number of studies, including Brown & Rozeff (1978), Collins & Hopwood (1980), Imhoff & Pare´ (1982), Brown, Griffin, Hagerman & Zmijewski (1987) and O'Brien (1988), have compared the quality of forecasts based on time series models with that of the analyst forecasts. The evidence generally suggests the superiority of analyst forecasts because analysts are good at incorporating a variety of input in their forecasts.

2.2.2. Analyst forecast based measure: Analyst Forecast Error and Earnings Forecast Revision

Brown et al (1997) supports the direct use of analyst forecasts of earnings to measure earnings surprise. Due to the analysts' ability to use information and timing in their forecasts, they are able to revise their forecast and reflect up to date information in a timely manner.

Analysts forecast earnings based measure of earnings surprise uses analyst forecast error. It is computed as the difference between the actual earnings and forecast of reported earnings. Forecast error is usually scaled by security price for cross-sectional comparability purpose.

$$FE_{it} = \frac{e_{it} - F[e_{it}]}{P_{it}} \quad (2.2.2.1)$$

Where,

FE_{it} is forecast error

e_{it} is actual reported earnings for stock i at time t.

$F[e_{it}]$ is the forecast of reported earnings for stock i at time t.

P_{it} is stock i price at time t.

According to PEAD theory, the future abnormal returns should be positively correlated with the most recent earnings forecast error. This methodology is typically used by Freeman and Tse (1989).

An alternative analyst forecast based measure of earnings surprise is forecast revision, which is calculated as the change in analyst earnings forecasts divided by stock price. The insight is if there is a greater change in analyst earnings forecasts then there is a greater earnings surprise.

$$REV_{it} = \frac{F[e_{i,t}] - F[e_{i,t-1}]}{P_{it}} \tag{2.2.2.2}$$

Where,

REV_{it} is earnings forecast revision

$F[e_{it}]$ is the forecast of reported earnings for stock i at time t.

$F[e_{i,t-1}]$ is the forecast of reported earnings for stock i at time t-1.

P_{it} is stock i price at time t

According to PEAD theory, REV should be positively associated with future abnormal return. This methodology is typically used by Mendenhall (1991).

There is also a slightly different measure of REV by Chan, Jegadeesh and Timan (1996), which is a six month moving average of past changes in earning forecast by analysts. By using this moving average of past changes in earnings forecasts by analysts, information is assumed to be released gradually over time.

The shortcoming of this measure is that, there is a potential of bias while using analyst forecasts due to lags in publication of analysts' forecasts. (see O'Brien (1988); Abarnbanell and Bernard (1992).

2.2.3. Price-based measure: Cumulative Abnormal Returns and Buy Hold Abnormal Return

Supporters of this measure are Beaver et al (1980); Beaver et al (1987), Chan et al (1996), and Bernard and Thomas and Wahlen (1997)…

In this method the calculation of surprise involves the abnormal return, which is the difference between individual stock return and market stock return. Abnormal stock return can be calculated either by a market adjusted model, market model, CAPM, multi factor model, or Matched-firms returns. Among these models the first two models are most commonly used.

i) In *the market adjusted return model*, defined by Brown and Warner (1985).

$$AR_{it} = R_{it} - R_{mt} \quad (2.2.3.1)$$

Where,

AR_{it} is abnormal return of stock i at time t

R_{it} is single stock return at time t

R_m is market stock return at time t

The use of market adjusted return seems doubtful because it does not adjust for basic CAPM β risk. However, Brown and Warner (1980, 1985) found that the simple mean returns model often yields results similar to those of the more sophisticated models, because the variance of abnormal returns is not reduced much by choosing a more sophisticated model.

ii) In the *market model*, abnormal return is calculated:

$$AR_{it} = R_{it} - \alpha_{it} - \beta R_{mt} \quad (2.2.3.2)$$

Where

AR_{it} is abnormal return of stock i at time t

R_{it} is single stock return at time t

R_m is market stock return at time t

α_{it} is constant.

β is systematic risk.

This model assumes the risk free interest rate included in α is constant, whereas market returns are assumed to change.

iii) *The basic CAPM model*:

$$AR_{it} = R_{it} - R_f - \alpha_i - \beta(R_{mt} - R_f) \qquad (2.2.3.3)$$

Where

AR_{it} is abnormal return of stock i at time t

R_{it} is single stock return at time t

R_m is market stock return at time t

α_{it} is constant.

β is systematic risk.

R_f is the risk free rate.

iv) *The multi factor models*, such as Fama-French 3 factor model, Carhart 4 factor model or APT model:

$$AR_{it} = R_{it} - \alpha_i - \sum \beta_j F_j \qquad (2.2.3.4)$$

Where

AR_{it} is abnormal return of stock i at time t

R_{it} is single stock return at time t

α_{it} is constant.

β_j is risk associated with each individual factor F_j

v) Matched-firms returns/sort

This methodology assumes that there are factors that affect returns. All returns will be sorted into lets say 10 deciles by size and then each decile continues being sorted by other factor e.g. book-to-market value. The expected return for each group will then be computed and used as "normal return" for that group. The deviation of a stock return from "normal return" of the group it belongs to, will be the abnormal return. This method is problematic because the results change when sorted by different characteristics; therefore the level of accuracy is low.

In addition to different ways to calculate abnormal returns, there are two ways to test the non-normal distribution in order to find out the influence of news by time: Cumulative Abnormal Returns (CAR) and Buy and Hold Abnormal returns (BHAR).

CAR is cumulative abnormal returns, which is the sum of the differences between the expected return on a stock and the actual return that comes from the release of news to the market, calculated by following formula

$$CAR^{i}_{t,\,t+k} = \Sigma_k AR_{i,\,t+k} \qquad (2.2.3.5)$$

Where

$AR_{i,\,t+k}$ is the abnormal returns on stock i on the day t+k

$CAR^{i}_{t,\,t+k}$ is the cumulative abnormal returns on stock i over the period t to t+k

Following the main stream of literatures, we assume that if there is no influence of earnings news CAR will follow normal distribution.

$$CAR^{i}_{t,\,t+k} \sim N(0, \sigma 2_{i,\,t+k}) \qquad (2.2.3.6)$$

Buy and Hold Abnormal Returns ("BHARs") measure the difference between the compounded actual return and the compound predicted return. BHAR is calculated by

$$BHAR_{it} = \prod_{t=0}^{t}[1 + R_{it}] - \prod_{t=0}^{t}[1 + R_{mt}] \qquad (2.2.3.7)$$

Where:

R_{it} is the time *t* arithmetic return (including dividends) on security *i*

R_{mt} is the time *t* arithmetic return on the market weighted index

Similarly, following the law of large number of studies we assumed BHAR will follow normal distribution if there is no influence of news.

$$BHAR_{it} \sim N(0, \sigma 2_{i,t}) \qquad (2.2.3.8)$$

When there are N firms in the category, we use average across the number of firms. The t test for normality will be used to detect the drifts.

$$t_{CAR} = \overline{CAR_{i\tau}} / \left(\sigma(CAR_{i\tau}) / \sqrt{n}\right) \qquad (2.2.3.9)$$

or

$$t_{BHAR} = \overline{BHAR_{i\tau}} / \left(\sigma(BHAR_{i\tau}) / \sqrt{n}\right) \qquad (2.2.3.10)$$

In a not so long event window length using CAR or BHAR is almost similar. For long horizons, BHAR seems conceptually better. BHAR tend to be right skewed (bounded from below!).

Amongst the three measures of PEAD, the price based method focuses on price reaction to the earnings news and suggests that the surprise is well reflected directly by the change of daily price around the event. This price-based method is therefore widely and commonly used especially with the first two measures of abnormal returns: market adjusted model and market model. For this reason, this thesis demonstrates and uses the price based measure, CAR for the market adjusted model first established by Brown and Wanner (1985), and consequently used frequently by other researchers such as Beneish and Gardner (1995); Gregoriou (2006) among others , due to its accuracy, and popularity.

2.3. Evidence of PEAD

Using different methodologies which were listed in the previous parts, most of empirical analysis over the last 4 decades, against the market efficient hypothesis, proves that PEAD exists everywhere both in the developed and the emerging markets. Securities with positive earnings surprises will drift further than normative predicted prices, and securities with negative earnings surprises will drift below the predicted prices.

Ball and Brown, (1968) first reported that estimated cumulative abnormal returns continue to drift up after every quarterly earnings announcement for good news firms and down for bad news firms. The return residuals for earnings surprises portfolio persisted for as long as two months after the announcement. Their sample includes 261 firms in the nine fiscal years 1957 to 1965. The sample does not include young firms or that have failed, those firms that do not report on December 31 and those not represented on Compustat, the CRSP tapes and Wall street Journal. Their method is to construct two alternative models of what the market expects income to be and then investigate the market's reaction when its expectations prove false. They investigate net income and earnings per share using time series regression model and earnings per share using a naïve model. The distribution of the residuals then shows the behaviours of the drift.

The subsequent study by Jones and Litzenberger (1970) on two groups from Compustat, one group of 510 companies for the period 1962-1965, and the second of 618 companies for the period 1964-1967 shows drift for positive surprises but not for negative surprises; by Latane, Joy and Jones (1977) test on 975 standardised unexpected earnings shows drifts for both positive and negative surprises. Foster (1977) test using time series model for 96 firms during the period 1946-1974 show drifts for day -20 to day +20.

In fact there are numerous studies that demonstrate evidence of PEAD since its first discovery. Ball (1978) reviews the PEAD studies in the ten years following Ball and Brown. Ball's review includes not only evidence of PEAD but also explanations for the cause of PEAD as systematic experimental error, market imperfections and private costs of information processing, and failure of the two-parameter model. While most of the early studies on the PEAD suffered from limitations such as a small sampling size, sample selection bias and risk measurement error, the latter research on the PEAD shows continuous improvement in data selection process and research methodologies.

The extensive and detailed documentation of the PEAD in the following period are from: Foster, Olsen, and Shevlin (1984); Bernard and Thomas (1989), (1990); Albarbanell and Bernard (1992); Ball (1992); Bhushan (1994); Hew, Skerratt, Strong, and Walker (1996); Chan et al (1996); Rangan and Sloan (1998), Brown and Han (2000). More recently are Mendenhall (2004); Battalio and Mendenhall (2007). Most of these studies provide evidence against EMH because market fails in reflecting earnings news into stock prices while trying to explore the reasons behind PEAD phenomenon.

Foster, Olsen, and Shevlin (1984) use a sample of more than 56000 observations from 2,053 companies' quarterly data over the period from 1974-1981 on Compustat. They report that earnings are partially anticipated but if there is a positive (negative) surprise, then there is a positive (negative) drift of up to 13 weeks after earnings announcement. Drifts are persistent phenomenon over the study period with no concentration in any specific period. Consistent to common findings in previous literature, this paper intensively documented that the drift is negatively related to firm size variable and positively related to the sign and magnitude of earnings-surprise variable. The sign and magnitude of earnings forecast error independently explains 81% the variation in PEAD, and firm size independently explains 61% the variation in PEAD. This test's result based on the two earnings based models one scaled by the absolute value of earnings and the other scaled by the standard deviation of the forecast error. Their price based models and do not show drifts.

Bernard and Thosmas (1989) study 84792 firms' quarter data for NYSE/AMEX during the period 1974-1986 and 15475 firm quarter data for OTC stocks on NASDAQ system during the period 1974-1985. Their research provides intensive evidence of the PEAD. They reported that most drifts occur during the first 3 months subsequent to the earnings announcement and there is little evidence that drift exists beyond 180 trading days. In addition they also find the magnitude of the drift is positively related to the magnitude of the unexpected earnings and the absolute value of the drift is inversely related to the firm size. The methodology that Bernard and Thomas (1989) use is earnings based model to forecast standardised unexpected earnings.

In their following study Bernard and Thomas (1990) use 96087 announcements for 2697 firms from 1974-1986, and found PEAD exists for the four quarters following earnings announcement. A large proportion of drift happened within 5 days around earnings announcement. In this study they focus on explanation to the reason of PEAD. They investigate the hypothesis that price fails to reflect the extent to which the time series behaviour of earnings deviates from a naïve expectation. Their conclusion is that market price adjusts slowly to earnings information. Again in this study they use earnings based measure. Firms are assigned to one of 10 portfolios based on standardised unexpected earnings.

Following Bernard and Thomas (1989), Freeman and Tse (1989) worked on a sample of 1054 firm's quarterly data during the period 1984-1988. Their explanation for the existence of PEAD in their report said "as investors obtain post announcement information, they revise their initial estimates of persistence by reassessing the implications of past earnings for future earnings. As a result, post announcement security returns and continue to be influenced by previously announced earnings" (page 50).

Abarbanell and Bernard (1992) examined 178 firms for up to 44 quarters over the period 1976-1986. They formed portfolio of quintiles based on the magnitude of analysts' earnings forecast errors, and calculated cumulative abnormal (sized adjusted) returns up to and including the fourth subsequent announcement and found drifts.

Up to the early 1990s, the anomaly had been remarkably over time. In addition it was not explained by either the size or the book/market factor[3]. Finally, although there were a lot of speculations, including the fact that people used such a naïve forecasting model, nobody knew what was going on in this phenomenon. A survey of the literature up to the early 1990s is provided by Ball (1992). He characterized "the 'drift' in abnormal returns after quarterly earnings announcements" as being one of the two principal versions of the earnings-price anomaly. He then concluded there are two classes of explanation for earnings-price anomalies: the first one being the market truly is inefficient, and the other one being the market is efficient but the measurements were incorrect[4].

Bhuhsan (1994) undertook the study of 2,642 firms with 85,056 quarterly announcements on NYSE/AMEX covering the period 1974-86. Bhushan's findings confirm the relationship between the firm sizes and drift which was reported previously. It is interesting that he concluded that the different abilities to process information among investor in relation to transaction cost cause the PEAD. His methodology is earnings based measure.

Hew, Skerratt, Strong, and Walker (1996) examined UK companies' data in a comprehensive study. Their samples include 1442 final announcements from 1989 to 1992. Their results are qualitatively similar to the findings from previous US studies. They do not find high degree of drift on the day following the event day as in the US, but they do find that drifts continue for a considerable long period after earnings announcement (page 292).

Evidence of PEAD can be seen not only in the US or UK market data, but also in emerging market. Booth, Kallunki, and Martikainen (1996) provide another evidence of PEAD in Helsinki (Finland) Stock Exchange. Their sample include all 31 Finish firms listed during the period 1989-1993 This market also has evidence of PEAD for both positive news and negative earnings surprise. Their study used various methods.

[3] (see French and Fama 1993)
[4] Page 321

In the same year, Chan, Jegadeesh and Lakonishok (1996) confirmed that drifts in future returns over six to twelve months are predictable from previous returns and previous earnings news. Their sample includes all primary stock listed on NYSE, AMEX, and the NASDAQ from 1977-1993. Chan et al use all of the three measures of drifts mention above: SUE, CAR and REV. In the multivariate analysis after allowance for other variables: firm size, price momentum, market risk, and book to market factor they still found drifts.

Recently, studies on the PEAD have become more and more complex, from different angles and intuitively. Mendenhall (2002) study sample consists of 107589 firm-quarter observations from 4910 firms giving the conclusion that drift exists, but independent from historical persistence. In the following study in 2004, Mendenhall test result is consistent with Wurgler and Zhuravskaya (2002), found the strong relationship between the PEAD and the risk faced by the arbitrageurs. Liu, Strong and Xu (2003) provide another test for the existence of PEAD in the UK by a sample of 835 stock and 13,848 half year earnings figures over the period 1988-1998. Their conclusion is that whatever the measure of earnings surprises used there is evidence of PEAD in the UK; however, the different measures will give different drift effects. Asthana Sharad (2003) use the research design controls for firms size, magnitude, and sign of the forecast error, investor sophistication and value relevance/information content of earnings on 27260 quarter observations for 1613 firms. He found that drift declines significantly with the growth of information technology revolution and explain that the information technology reduces the trading friction and improves the market information efficiency. Schadewitz, Kanto, Hahra and Blevins (2005) provide evidence of PEAD in Helsinky (Finland) market again, during the period 1985-1993 for 41 days surrounding an interim announcement. They examined the different categories of investors around earnings announcements to provide additional evidence on the relationship between PEAD and investors' sotisphication in limiting the mis-pricing. They found that PEAD exists and is affected by the extent to which investors can limit the mis-pricing.

2.4. Explanations for PEAD

Though, there is not a generally satisfactory explanation, **t**he existing explanations of PEAD fall in two main categories: 1) Underreaction which includes three sub-categories: analyst underreaction, investor underreaction, and biased information processing; 2) Misspecification, which includes CAPM beta misspecification and trading (liquidity) risk.

2.4.1 Under-reaction to earnings surprises?

This is the most frequent explanation of PEAD in the previous stages of the literature. The norm under-reaction means that stock price does not reflect equilibrium in price. People, including analysts and investors who are advised by analysts, underreact; therefore they have to catch up later by trading. They need time to assess and adjust to information through trading and that impacts prices. The reasons for underreaction include analyst under-reaction, investor underreaction and biased information processing. All three factors lead to the market's inability to respond rapidly and completely to the publicly available earnings information.

2.4.1.1 Analyst under reaction

There are many papers in literature that indicate analysts' earnings forecasts are not efficient enough: Lys et al (1990), Abarbanell (1991); Mendenhall (1991); Abarbanell (1992), Ali et al (1992). Schipper (1991) also has a review of works on analyst forecast.

A significant piece of work is from Albarbanell and Bernard (1992), who carried out a test whether analysts over/under reaction to earning information as an explanation of PEAD. They tested if forecast errors can be explained by previous years earning change. The result shows that there is a positive relationship between the forecast errors and previous earnings change. The interpretation is that analysts are cautious and do not believe that rise in earnings will continue. If earnings are rising, the forecast is smaller than the actual earnings at time t. In fact, analyst under-react to the prior year's earning change. Their test suggested that analysts produce forecasts that are less naïve than simple seasonal random walks; however it still fails to recognize the full extent to which earning deviate from that process. At least one aspect of the anomalous post earnings announcement drift cannot be attributed to the behaviour of analysts.

2.4.1.2. Investor underreaction

Investors are the main market players and are affected by analysts' forecast. Investors' overdependence on analysts can be a reason of PEAD. In a review article, Lev and Ohlson (1982) describe PEAD as unwavering belief in market efficiency. Bernard and Thomas (1989) support hypothesis that market adjusts slowly to earnings information because it fails to recognize the full implication of current earnings on future earnings. Their study rejected the possibility that PEAD can be explained as the risk compensation of the risk factor for the investors. Their test for misspecification of CAPM holds true only under a number of conditions. They also look at the transaction cost; however, still many questions are unclear. Their results are in fact consistent with the statement that the market fails to recognize the full implications of current earning to future earnings.

Bernard and Thomas (1990) follow Rendleman et al (1987) findings, and others such as Wiggin (1991), Bartov (1992), Rangan and Sloan (1998) also support this hypothesis.

However, not all the studies agree with this explanation. Hirshleigfer et al (2003), among others, found that investors are not a reason of PEAD. They study how individual investors trade in response to extreme quarterly earnings surprises and on the relationship between individual investor trades and subsequent abnormal returns and found no evidence that either individuals or any sub categories of individuals in their sample causes the PEAD.

2.4.1.3 Biased information processing

An alternative explanation of PEAD is a source of biases in investor assessment of series correlations, a source of biases in sample selection or any other information processing such as biased research model designs, abnormal returns measurement. For example: Ball (1992), Bushan (1994), Rangan and Sloan (1998), Jacob, Lys and Sabino (2000).

In another review paper, Ball (1992) talked about two explanations for PEAD: (i) either the market truly is inefficient, or (ii) the market is efficient but measurements are incorrect, he mentions other factors in previous studies that could have bias such as errors in estimating rates of returns, errors in measuring normal (expected) returns, size as a proxy for expected returns, quarterly earnings information, annual report information, transactions costs, liquidity and trading-mechanism effects, overstated t-statistics, earnings variables proxy for expected returns, substantial information production costs or market inefficiency, and inefficient markets all can contribute to the PEAD.

Bhushan (1994) also points out that transaction costs, in conjunction with differing abilities among investors to process information, can result in drift. Rangan and Sloan (1998) criticize that Bernard and Thomas findings of PEAD could be due to research designs biases. Jacob et al (2000) also mention that Bernard and Thomas (1990) results may be due to the models used.

2.4.2 Misspecification of risk

Literature has not measured risk properly, while drifts look at future performance and is always risk adjusted. Misspecification of risk includes beta risk measurement and liquidity or trading risk for example in Shin (2006), liquidity risk is a special case of misspecification, trading risk, while Fama(1998) and Kothari (2001) and many other papers are about beta measurement risk.

2.4.2.1. Beta risk measurement or deficient CAPM

Misspecification of asset pricing models explanation caused a lot of attention from researchers since early stage. Ball (1978) and Foster, Olsen and Shevlin (1984) studies are consistent with CAPM mis-specified, and rejected the possibility of an interference of an information market or time period explanation. Fama (1998) also found that most long term return anomalies tend to disappear with reasonable changes in technique or when alternative approaches are used to measure them. Recently, Liu, Strong and Xu (2003) who examined PEAD in the UK also found that different measures give different drift effects.

In addition, in the CAPM, beta is the only thing which values the market. This could be the limitation of the academic ability in quantifying risk that affects asset pricing process. Chordia (2009) and other previous researchers such as Ball (1992), Kothari (2001), Bhushan (1994), Battalio and Mendenhall (2007) suggest that PEAD could be nothing more than risk premium measured inaccuratly or failed identify.

2.4.2.2. Liquidity risk and a new explanation for PEAD – stock liquidity

Most studies of PEAD assume that risk is constant during the period of earning announcements. However, this has been questioned by a few researchers.

Kim and Verrecchia 1994 suggest a model in which disclosures create increasing information asymmetry, decreasing stock liquidity thus increasing bid ask spread, and increasing trading volume. As earning announcements increases the information flows into the market, it creates different judgements about firm's performance and gives opportunities for the traders who are capable of informed judgements, to exploit their ability to process public information. This increases the ability of rising information asymmetry. This in turn, creates the situation where the investors have to increase bid ask spread to protect themselves from informed investors. Despite the increase in bid ask spread, the information flows to the market leading to an increase in trading volume around earning announcements.

The idea that earning announcements changes risk leading to price drift was continuing raised by Shin (2006). Shin suggests a theoretical model of disclosures which has several advantages in terms of tractability in a dynamic context, and outlines the theoretical features of the model such as a leverage effect, and the volatility feedback hypothesis. Shin introduces uncertainty concerning the rate of information flow to the firm in the model, and illustrated that the model is capable of generating short-run momentum and long-run reversals. Shin suggest "Following unexpected good news, there would be an upwards revision in perceived risk, and following the news below prior expectation, there would be a downward revision in perceived risk. With risk adverse investors, these shifts in risk would be priced so as to produce higher expected future returns following unexpectedly good news and lower expected future returns following unexpectedly bad news." Firms that have had a positive surprise in earnings have more volatile subsequent earnings than firms that have had a negative surprise in earning. Shin's paper, however, is a theoretical paper. As discussed by Kanodia (2006) it is lacking firm size factor in it and "in Shin's model, stock prices move only in response to public disclosures by the manager. Yet empirically, observed drifts occur even in the absence of additional public disclosures".

In addition to the above two theoretical papers, there are very few empirical papers studying liquidity risk as an explanation of PEAD, though it can be seen that the number is increasing. Bushan is the first to show indirectly that there is a link between liquidity and PEAD, i.e. the magnitude of PEAD is directly related to the costs of trading. Since Bushan, to the best of my knowledge, Sadka (2006) and Ng et al (2008) are the only two to investigate thoroughly the importance of liquidity, i.e. transaction cost which proxied by bid ask spread or bid ask spread and commission, in explanation to the reason of PEAD. There are very less number of studies with regard to the importance of liquidity factor in relation with PEAD. Meanwhile liquidity is a multi dimensional concept, allowing different studies to employ different liquidity measures. The reasons of PEAD and the link between PEAD and liquidity therefore are still unclear and very confusing. The following parts of the chapter will review the literature of the linkage between PEAD and stock liquidity.

2.5. New explanation for PEAD: Stock Liquidity and measures of stock liquidity

As discussed above, liquidity effect in fact is a type of risk misspecification which could be the cause of PEAD. This part will focus on the multi-dimensional characteristics of stock liquidity, through different measurements in literature.

Stock liquidity by definition is the ability to trade the stock rapidly with little price impacts. It is an important characteristic without which the investors cannot trade. Highly liquid stocks will attract more investors than low liquid stocks. A growing number of researches show that there is an inverse relation between stock liquidity and returns. See Amihud and Mendenson (1986) Brennan and Subrahmanyam (1996), Brennan, Chordia and Subrahmanyam (1998) Easley, Hvidjaker, and O'Hara (2002) among others. This develops a possibility that PEAD and liquidity have some determinant relationship.

Stock liquidity is a multi dimensional factor; one could value this characteristic from different angles. There is less agreement on the measures of liquidity. Existing literatures have used different measures of liquidity, of which the followings are the important ones.

Trading volume and standardised trading volume

Trading volume in fact is a popular measure of liquidity; see Brennan et al (1998) among others. Stock with high liquidity will be traded at high volume and stock with low liquidity will be traded at low volume. However, there is a potential problem in using trading volume as it does not take into account the differences in the number of shares outstanding and number of shareholders.

For the above reasons, another measure of liquidity is standardised trading volume, which is the ratio of trading volume divided by the number of share outstanding.

Amihud et al (1986) mentioned that stock liquidity is correlated with trading frequency so we can observe the trading frequency and use it to proxy liquidity. See Datar et al (1998) Chordia et al (2001); Hedge and Mc Dermott (2003), Gregoriou (2008) among researchers they use standardised trading volume to proxy for stock liquidity.

Firm size

Though the firm size is not directly related to liquidity according to the liquidity definition the firm size is correlated to other factors such as trading volume, number of shareholders, stock price continuity, and the number of market makers. See Garbade, (1982); Stoll (1985) and Kluger et al (1997).

Price impacts

Price impact is the price response to the large orders. The trading literature measures price impact using the transaction prices. This formal liquidity measure even though widely used, is only available for large trade so I cannot use it in this framework (see Kraus and Stoll (1972). In addition, its adequacy as a liquidity measure is still questioned, see Matei Demetrescu (2006); Stange et al (2008).

Effective commission rate

Effective commission rate is also being used to proxy for market liquidity in other research, for example in Jinliang Li et al (2003). This measurement however is subjectedly dependent on individual trader, thus cannot be used commonly.

Proportion of zero-return trading days

This measure of liquidity in fact is an inverse measure. It requires time series of daily returns. See Bekaert (2003) for more details. This measure however suffers from serious limitations because of its inability to capture liquidity entirely.

Standardised turnover-adjusted zero-volume day

This measure is recently constructed by Liu (2006) and it takes into account many factors such as trading quantity, trading cost and especially trading speed – the continuity of trading and potential delay in executing an order.

$$LM_{ix} = ZV_{ix} + \frac{1/TO_{ix}}{Deflator} * \frac{21x}{N_i} \quad (2.5.1)$$

Where,

LM_{ix} is the stock i's standardised turnover-adjusted zero-volume days over the period x month,

x= 1,6,12

ZV_{ix} is the stock i's number of zero-volume trading days over prior x month,

TO_{ix} is the stock i's turnover the prior x-month, calculated as the sum of daily turnover the prior x month where daily turnover is the ratio of the number of shares traded on a given day to the number of shares outstanding at the end of that day.

21 is standard number of trading day in a month,

N_i is the total number of trades per day, in the market over the prior x month,

Deflator is arbitrarily chosen to ensure that the ratio $0< \frac{1/TO_{ix}}{Deflator} < 1$ for all sample stocks. It is equal to 11,000 where x=6,12 and equal 480000 where x = 1.

This measure uses the pure number of zero trading days over the prior x month to identify the least liquid stock and rely on the turnover to indicate the most liquid stock among frequently traded stocks classified by the pure number of zero-volume trading days. This measure however contains a potential problem as it excludes the less frequently traded stocks.

Amihud illiquidity ratio

This is the average of the ratio of daily absolute return to the daily volume in dollars; developed by Amihud et al (2002) following the Kyle (1985) model.

$$PI_{it} = \frac{1}{D_{it}} \sum_{t=1}^{D_{it}} \frac{|R_{itd}|}{DV_{itd}} \qquad (2.5.2)$$

Where,

PI_{it} is the stock i's illiquidity ratio,

$|R_{itd}|$ is the absolute value of daily return

DV_{itd} is the daily dollar volume (in millions) on day d month t for stock i

D_{it} is the number of valid days in month t for stock i

Amihud illiquidity ratio is designed to capture the cost of trade. The cost of trade in fact is already captured in bid-ask spreads which is mention in the next section bellow. Moreover, an advantage of Amihud illiquidity ratio is to account for the cross sectional variation within the sample. In this thesis, my samples are split into different indices, already taking into account the cross sectional variation. It becomes unnecessary to use Amihud ratio in such a framework. Lastly, if stock trading volume is zero on a particular day its Amihud illiquidity ratio cannot be calculated, so it excludes the effect of trading absence.

Bid ask spread

In organized stock exchanges, liquidity is maintained by the market makers, the people who are conferred the right by the stock exchange authority, to set up different price level of buy and sell. The market makers create the market to trade the stocks by buying at bid price and selling at a higher ask price. The difference between bid price and ask price, the bid-ask spreads, is the source for market makers to compensate their ability and costs to provide the market for traders. Due to the above nature, size of the bid-ask spreads have been frequently used to measure liquidity of stocks. Higher the liquidity of the stock smaller is the bid-ask spreads. It is obvious that higher the bid ask spread, higher the risk and lower the bid ask spread lower the risk. By looking at impacts of earnings announcements on the bid ask spread around the news, one could see how bid-ask spreads can measure liquidity risk around public disclosures.

Given the advantages and disadvantages of the above measures of stock liquidity, (i.e. Trading volume does not take into account the differences in the number of shares outstanding and number of shareholders; the firm size is not directly related to liquidity according to liquidity definition; Price impact is only available for large trades) this thesis chose bid ask spread as the main measure of stock liquidity:

2.6. Bid ask spread and the PEAD

2.6.1. Bid ask spread measures

Bid-ask spreads are measured in three different terms; “the quoted bid-ask spreads”, which is the difference between the ask price quoted by a dealer and the bid price quoted by a dealer at a point of time; “the relative bid-ask spreads”, defined as the ask price minus the bid price, divided by the mid-price, which is the average of the bid and ask prices; and “the effective bid-ask spreads”, which is computed as twice the absolute value of the difference between a transaction price and the mid-price in effect at the time of the trade. Some key studies such as Amihud and Mendelson (1986), Grossman and Miller (1988), and Vijh (1990) use quoted bid-ask spreads to proxy stock liquidity; Ofeck and Recharson (2003) use relative bid-ask spreads; meanwhile, effective bid-ask spreads is included to proxy for liquidity by Heflin and Shaw (2000), Hedge and McDermott (2003) and Gregoriou and Ioannidis (2006), Gregoriou (2010).

Formerly, in literature, relative spread was commomnly used. However, as Roll (1984) first pointed out, this proxy was problematic due to the fact that the actual trading occurs mostly within the bid ask bounced. For a more accurate measure of that reason, Lee et al (1993), Heflin and Shaw (2000), Hedge and McDermott (2003) and Gregoriou and Ioannidis (2006), and Gregoriou (2010) included effective spread to proxy for liquidity in their research. Unfortunately, both measures by relative bid-ask spreads or effective bid-ask spreads included mid price. This causes other problems such as in case of the mid-price change, bid ask spreads will also change. To minimize shortcomings of the above two methods, I have also included quote bid-ask spread in this study.

2.6.2. Bid ask spread decomposition

Historically, there have been three main theoretical models of decomposing bid-ask spreads: 1) The trade indicator regression models pioneered by Glosten and Harris (1988); 2) The time series co-variance models pioneered by Stoll (1989); 3) The combination of the above two models first applied by Huang and Stoll (1997). Other models were built on and extended from these two (see Campbell, Lo and Mackinlay (1997) for more details.

Spreads was first decomposed in permanent and transitory components using trade indicator regression form by Glosten and Harris (1988). Permanent component is due to the inventory costs and transitory component is due to information asymmetry costs. Their test results prove that significant fractions of NYSE common stock spread are due to information asymmetry. Researchers also using trade indicator regression model are Mahavan, Richardson, and Roomans (1997). They decompose spreads with adverse selection and order-processing components; inventory holding cost is assumed to be zero. They conclude that adverse information cost increases through the day of information shock, while the order-processing components cost decrease.

Stoll (1989) pioneers a model of time series behaviour of spread and specifies the relationship between the quoted spread and realized spread. Based on that, he establishes a relationship between a quoted spread and the co-variance estimate of the spread that depends on two parameters, the probability of a price reversal and the amount of a price reversal. By using data from the NASDAQ on quoted spread and transaction prices, he infers these two parameters, from which he could calculate the relative proportions of three spread components: order processing cost, inventory holding cost, and information asymmetry cost for data set from October, November and December 1984. Following Stoll, some other authors use series co-variance as George, Kaul and Nimalendran (1991). However, George, Kaul and Nimalendran (1991) model assume a zero inventory cost.

Huang and Stoll (1997) in “The components of the Bid-ask spreads” found that existing bid ask models, which includes trade indicator regression model and series co-variance models, did not decompose spread fully. They made two extension tests to the trade indicator regression model to separate the effects on order processing and inventory costs. Their study also shows that spread components vary depending on the size of a trade.

There are studies later on that are unambiguous in isolating the three cost components of bid-ask spreads, and therefore consistent with the work of Stoll and Huang and Stoll, such as Menyah, and Paudyal (2000). However, there are also studies that do not give results that can be interpreted as in the above three components, for example Winne and Majors (2007) among others support the hypothesis of no inventory holding costs in order-driven markets.

In another direction, empirical studies also show that bid-ask spreads are related to some of the characteristics of securities such as stock price, trading volume, volatility of return, number of market dealers, the risk of stock and other factors, for example, Atkins and Dyl (1997) and more recently Gregoriou, Ioannidis and Skerratt (2005). Gregoriou et al (2005) tests the model with the multi variate linear relationship between Spread and 4 independent variables: Variance of Forecast, Variance of Returns, stock Market Value, Volume of stock trading to explain spread. Information asymmetry in this study is proxied by Variance of forecasts. From the tests, authors found that not only volatility of returns but also disagreement among analysts were significant. Volatility captures information uncertainty about current period to the end of the year: It reflects economy wide aspects of uncertainty. Disagreement related to firm specific issues, for example poor results add to volatility. Poor performance causes delay in reporting the year end results and cause additional information asymmetry between market maker and market investors. For the statistical significance of the Variance of Forecast in the presence of the other variables that are regularly included in modelling spread, their explanation is that disagreement among analysts affects the behaviour of market makers, and those market makers act to protect themselves from informed traders by increasing spreads. Market makers cannot recognize types of traders they are dealing with, some have information advantages, others do not. As thus, market makers protect themselves from those informed traders by increasing the spread. The study toward the direction that bid ask spread related to characteristics of securities such as stock price, trading volume, volatility of return, number of market dealer, the risk of stock and other factors is still being developed. Though these multi-variate models of bid ask spread in study such as Gregoriou et al (2005) do not decompose spread into three different cost components the role of adverse selected information component is emphasized.

At current time, in terms of costs, the existing market microstructure theories imply that bid ask spread must cover three costs faced by a dealer: The order processing costs, inventory holding costs and adverse information cost. The third component is sometimes known as information asymmetry cost. The inventory holding cost is the fee associated with risk of holding inventory of the stock, which is first argued by Demsetz (1968) and Tinic (1972). The order processing cost, conceptualized by Benston and Hagerman (1974) and Stoll (1978), is the actual cost charged by the market makers to process the order which includes labour, communication, clearing and record keepings. Finally, the information asymmetry or adverse information cost is established by Copeland and Galai (1983), Glosten and Milgrom (1985) and recently by Foster and Viswanathan (1993) and Madhavan et al (1997).

2.6.3 How is bid ask spread an explanation for PEAD?

2.6.3.1. Earnings announcements and bid-ask spreads

There have been less number of studies on the subject of market liquidity impacts of earnings announcements with liquidity measured by bid ask spread. Kim and Verrecchia (1994) suggest a theoretical model that information disadvantage of the market makers increases the bid-ask spreads. Information asymmetry increases around earnings announcements due to information flows from public disclosures. The informed traders will exploit their ability to process public information. In turn, investors have to increase bid-ask spreads to protect themselves from informed traders. Increase in bid-ask spreads suggest that market liquidity decreases due to the event.

Other studies of the behaviour of the bid-ask spreads around earnings announcements in NYSE are Foster and Viswanathan (1993) and Krinsky, and Lee (1996). These studies use intraday data. The first paper’s finding is that order processing cost does not account much for the change in bid-ask spreads, while information asymmetry dominates this change. Krinsky and Lee’s finding is that the total bid-ask spreads might not change significantly because information asymmetry increases while order processing cost and inventory holding cost decrease.

In a working paper, Voetman (2000-2006) uses Stoll’s methodology to provide evidence from Copenhagen Stock Exchange that quote bid-ask spreads does not change significantly because of earnings announcements even though information asymmetry increases. His findings also show that positive earnings have less uncertainty than negative earnings. This is a study on a code law country using daily data.

Acker et al (2002) provides evidence from London Stock Exchange using daily data over the period from 1986-1994. Due to earnings announcements bid ask spreads fall and trading volumes and returns volatility rise.

Recently, Gregoriou (2008) investigated the impact of earnings announcements on the components of bid-ask spreads on the London Stock Exchange using intraday data. Information asymmetry cost has been found to dominate the change in the bid-ask spreads, resulting in bid-ask spreads to decrease.

Above studies stay only at the point to explore the impact of earnings announcement on stock liquidity; they have not explored the relationship between liquidity and the PEAD.

2.6.3.2. Bid ask spread as a measure of stock liquidity in relation to PEAD

Based on Kim and Verrechia (2001) suggestion, in explaining drift, spread has two potential roles:

1. To indicate the cost of transacting. A large spread might discourage trading, and therefore might lead to a lag in information getting in to prices. (But this wouldn't explain the long term results)
2. As a measure of risk. Information causes the risk of the stock to increase.

Though still very limited, there are two directions in studies on the linkage between PEAD and spread as measure of stock liquidity: implication of transaction cost to explain PEAD and information based explanation.

Transaction cost (proxied by spread)

Bhushan (1994) is the first researcher who indirectly examined the relationship between liquidity and the PEAD, by relating transaction cost and the PEAD. He redefines Bernard and Thomas (1990) model with a transaction cost framework. However, he uses annual trading volume in money to proxy for the inverse of indirect cost of trading, and stock price to proxy for direct cost of trading. Stocks with high transaction cost have lower volume of trading and vice versa. His work shows that stocks with high transaction costs drifted more. Especially after control for transaction cost, firm size and analysts play no role in explanation of PEAD. However in this study, there is an absence of the direct link between liquidity and PEAD.

Brown (1997) indicates that PEAD is not evident throughout so it challenges transaction cost explanation of PEAD. In addition, Spiegel and Wang (2006) questions should transaction costs being proxied by previous year trading volume? Trading volume can indicate the degree of liquidity but it does not tell us the cost of trading so this methodology in fact goes around.

Although all of the above studies were after Bhushan (1994) provided the link between transaction cost and PEAD, transaction cost has not been used to provide an explanation of PEAD, until a recent study by Ng et al (2008).

To the best of my knowledge the only two studies directly linking the relationship between bid ask spread and the PEAD are Ng et al (2008) and Chordia et al (2009). Ng et al use bid ask spread to proxy for transaction cost. They provide evidence that stocks with higher transactions cost have a smaller reaction to the earnings announcement, and the drift is larger for stock with high transaction cost. The results confirm that spread provides an explanation for the PEAD. This study uses US data only. In addition there is absence of information factor in the explanation.

Chordia et al (2009) use a multiple measures on transaction cost (proportional effective bid-ask spreads, dynamic institutional trading costs, and the market impact costs) following Keim and Madhavan (1997), Korajczyk and Sadka (2004) and Chen, Stanzl, and Watanabe (2004) and indicates that transaction cost can possibly be an explanation for the PEAD. Chordia et al prove that "transaction costs account for 66% to100% of the potential paper profits from the long-short strategy designed to exploit the earnings drift". Their research however, excluded illiquid stocks, i.e. stock with price lower than £5 and stocks with at least ten days of trades each month, meanwhile stocks with less frequently trading largely drives liquidity premium. In addition, Chordia et al (2009) construct one month liquidity measures in that research fail to capture information from stocks that have zero trading volume over the whole month. According to Bhushan and Chordia et al PEAD will not be exploitable after transaction cost. Chordia's analysis of transaction cost (proxied by bid-ask spreads, market impact costs, and institutional transactions costs) proves that most of the net profits disappear upon accounting for trading costs. However, previous studies generally rule out transaction cost as an explanation of PEAD. Moreover, Ball (1992) and Battalio and Mendenhall (2006) studies claim that PEAD is too large to be bounded by transaction cost. Mendenhall provides evidence that after transaction cost investor can still earn a 14% hedged portfolio return a year.

Information based factor

There are very few studies indirectly linking the information based factor and the PEAD.

Lee and Swaminathan (2000) investigate interaction between price momentum and previous trading volumes to predict cross-sectional returns. They documented that earnings surprise is caused by higher (or lower) future earnings of low (or higher) volume stocks. Investor expectation affects not only stock returns but also the stock trading activity; therefore the information content of trading volume is related to market misperception of stock future earnings.

Chambers, Jennings and Thompson (2004) use proportion of zero return trading day in the past twelve months as proxy for liquidity, firm with high proportion is expected to have low flow of information and high resolution of uncertainty around earnings announcement, and vice versa. They found that returns are concentrated around earnings announcements for firms with low information flow than for firms with high information flow. However, their study has a problem of lack of news and the assumption of equal transaction cost across firms is not realistic.

Sadka (2006) is another one to study indirectly the link between PEAD and liquidity. His studies use price impact to proxy for stock liquidity and then follow Glosten and Harris (1998) model, propose to decompose liquidity into two components, the fixed component (associated with market-wise information) and variable component (associated with firm specific information). Unexpected systematic (market-wide) variations of the variable component rather than the fixed component of liquidity are shown to be priced within the context of momentum and post-earnings-announcement drift (PEAD) portfolio returns. The variable component of price impact therefore can explain part of PEAD and price momentum. He finally suggests that a bench mark model to explore PEAD should include information based on liquidity risk factor.

2.7. Summary

In summary, PEAD has been discovered for over four decades. Since then there have been so many studies using different methodologies to explain the reason for it. Even after so many studies, not much has been solved to the general satisfaction. In addition, there is still silence in cross countries comparisons. This thesis will explore the direct relationship between PEAD and stock liquidity on the growing concerns from academic community. Secondly, this thesis includes a comparison of two different accounting systems code law and common law (see the next chapter for further information about code law and common law systems). Lastly, this study explores in particular the impact of the information component of liquidity on the PEAD.

CHAPTER III

DATA SELECTION AND METHODOLOGY

There are two primary objectives of this chapter. The first one is to describe the data collection and sample construction to obtain the final sample. The second is to describe the methodology used in the research.

My data sample covers three countries: the US, the UK, and France with 1821 firms listed in 8 indices, of which 4 indices are from London Stock Exchange and the alternative investment market, 3 indices from US Stock Exchanges, and 1 index from Paris Bourse. My samples will includes both liquid and illiquid stocks from the London Stock Exchange, covering two types of accounting systems, one is the common law system used in the US and the UK, and the other is code law based system used in France. There is difference between code law and common law accounting systems. In the common law countries, earnings information is that stock information is released on the day of the event, whilst in the code law countries earnings information is released to the markets much earlier (month earlier) through a variety of channels before the official announcement date[5]. Therefore the earnings news in code law based countries has already been digested by the markets and is no longer new news.

3.1 Companies and Indices covered

3.1.1. London Stock Exchange

Data was collected from DATA STREAM Advance and FTSE PDF files.

FTSE™ 100

The capitalisation-weighted index of the share prices of the 100 largest companies (based on market capitalization) traded on the London Stock Exchange[6].

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[5] See Ball, Korathi and Robin (2000) for more details about code law and common law accounting systems.

[6] The constitution list is modified quarterly by the end of March, June, September, and December.

FTSE250

The capitalisation-weighted index of the 250 companies on the London Stock Exchange that are quarterly selected as being the 101st to 350th largest companies[7].

FTSE Small Cap

The capitalisation-weighted-index consists of companies outside of the 350th largest companies in the UK on the London Stock Exchange[8].

FTSE AIM All-Share

The capitalisation-weighted index consisting of all companies quoted on the Alternative Investment Market, a sub market of the London Stock Exchange that allows smaller companies to float shares with a more flexible regulatory system[9].

3.1.2 US Stock Exchanges

DJIA (The Dow Jones Industry Average)

The price-weighted index created by 30 of the largest and most widely held public companies in the United States.

NASDAQ 100

The modified capitalisation-weighted index comprises of the 100 non-financial largest stocks traded on the NASDAQ Stock Exchange[10].

S&P 100

The capitalisation weighted index of 100 largest companies by market capitalization in the S&P 500.

3.1.3 Euronext Paris

CAC40

The float capitalisation-weighted index comprises of the 40 largest and most liquid stocks trading on the Paris Bourse[11].

3.2. Data collection and calculation

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[7] The constitution list is modified quarterly by the end of March, June, September, and December.

[8] The constitution list is modified quarterly by the end of March, June, September, and December.

[9] Weighted index is adjusted by free load factor.

[10] Although firms with the largest market caps tend to have the largest influence on the index, its value is modified to keep any issues from having an "overwhelming" effect on the index results.
While the composition of the NASDAQ-100 changes in the case of delisting, the index is only rebalanced once a year, in December, when NASDAQ reviews its components and makes the appropriate adjustments.

[11] Float means that the weightings of each of the index's components are determined by the value of shares outstanding to the public. This prevents a large company that only issues a small amount of its shares from having a disproportionate amount of influence on the index's value

Daily stock closing prices, price indices, daily closing bid price, daily closing ask price, daily turnover by volume and daily price high and low were obtained from DATASTREAM ADVANCE for 90 days before and 90 day after the earnings announcements. The number of companies that have data available for each index are: CAC40: 40 companies; DJIA: 30 companies; FTSE100: 99 companies; FTSE250: 233 companies; FTSE Small Cap: 310 companies; FTSE AIM All-shares: 913 companies, NASDAQ100: 96 companies, S&P100: 100 companies. The selection criteria, is similar spirit to that of Hedge and Mc Dermott (2003), my final data includes stocks that have:

a) Not involved in a merger during the period of 90 days before and after earnings announcement
b) Not involved in a split during the period of 90 days before and after earnings announcement
c) Data available on the stock exchanges and on DATA STREAM Advance for 90 days before and after earnings announcement. We exclude firms that do not have data available of at least 10 day before an earnings announcement.

Quote bid-ask spreads, relative bid-ask spreads, effective spread are all calculated based on closing bid price and ask price. Quote bid ask spread is calculated as the difference between bid price and ask price. Relative spread is calculated as the difference between bid price and ask price divided by average of bid price and ask price (mid price). Effective spread is calculated as twice as much as absolute value of the difference between executed price and mid price.

Trading volume is calculated as turnover by volume times the average of the high price and low price on the day.

Pre-earnings announcement period is defined as period from day -90 to day -1. Post earnings announcements period is defined as period from day 0 to day +90.

3.3. Earnings announcements dates

In *London Stock Exchange,* dates of preliminary report of fourth quarter and final earning, results were taken from LSE's website through Regulatory News Services for 2006-2007. For companies that reported fourth quarter and annual preliminary earning results separately, we selected annual preliminary report dates. These dates are then compared to sources from companies' websites and also date of earliest earnings announcements released to the public, through various means of media such as press release, conference call, Internet etc. Basically, companies are required to submit the earning reports before 5PM on the day before announcement day. On the next day, the announcement days, information will be available on the stock exchange for most companies at around 7AM, before the market open. The analyst conference then will be held in the morning[12].

In the *United States Stock Exchanges*, earnings announcements dates were earliest fourth quarter and annual earnings release dates, taken directly from companies' websites, for 2006-2007. These are also the dates of reporting to SEC, by regulation, on form 8-K, which classified as "current reports" or "report of unscheduled material events or corporate event". Foreign companies provide form 6-K of Foreign Private Issuer instead of the form 8-K. The releases were through the press, conference call, Internet etc. Usually, the press releases come first on the announcement day. The announcements will then be made through conference and webcast either before market open or after market close.

For various reasons, there are a few companies in the US, where the filing dates are not on the same day as press/internet release and conference call dates. However this is only for a very few, and the filing dates are not too far from dates of other means of publication[13]. There are also some companies that do not report earning on form 8-K after a delaying period. Instead, they report directly on form 10K, the annual report, which provides a comprehensive overview of the company for the past year, on the same day with press release and conference call and Internet casting[14]. In such cases, I still took the earliest earnings announcements date to the public, which normally start with a press release date.

[12] Different companies have different way of calling their earnings announcement dates. Usually they call this "annual/final and fourth quarter financial results" date. Sometime they call it "earning results" date only. But notice that, the turnover or sale report could also be called the final results. We must take a look at each report to make sure that is preliminary earning reports, which included profit and loss account, earning information and was firstly released to the investors through conference call, web-cast, or press.
In addition, some companies announced in several stock exchanges due to it registered at those markets. The announced date in the index's stock market will be chosen.

[13] (I.e. NASDAQ 100 - AMGEN INCORPORATED in 2006.)

[14] (i.e. NASDAQ 100 - ECHOSTAR COMMUNICATIONS CORPORATION)

For both UK and US, companies sometimes provide a corrected/amended version of their announcement. If the amended version affected earning results, I took the amended date [15] as the announcement date.

At the *Paris Bourse*, the earnings announcements dates are final earning results report dates taken from the Euronext Paris websites, and then compared to sources from companies' websites. The earliest earning release dates are selected in the same pattern. Press releases usually come first, followed by conference and other means of media.

During the process of collecting data, I have found that companies listed in different stock exchanges have different ways of presenting their earnings announcements, however they all go through the same process: press release, filing to the stock exchange, investor/analyst conference calls, and webcast.

In addition, in their preliminary earning reports, some companies release fewer details than others. For the United States market, one might not provide a full balance sheet on form 8-K like many others but only selected financial results. The full details will appear later on the annual 10-K. The same situation is applied to companies on the LSE but the companies on LSE tend to provide more comprehensive reports than in the US and companies in CAC40 provide the most comprehensive final results. However, this thesis just ignores the matter of publication level because there are not many companies that provide less information.

By selecting data from the UK, France, and US in this thesis I also want to make a comparison between common law countries, as in the UK and US; and code law countries, of which France is one. In general, the role of accounting statements in the common law countries is to inform the stock market about the Company's financial status. When earnings announcements are made, that is actually new information. Conversely, in code law countries, the role of accounting statements is not to inform the shareholders because those people already know company financial situation through other internal means. The role of earnings announcements here is to announce what dividend the company should pay and what tax the company has to pay. I would

[15] NASDAQ 100 - EXPEDITORS INTERNATIONAL OF WASHINGTON INC in 2007 and some other companies on LSE.
KLA-Tencor in 2006 is an example

therefore expect a differenct reaction to earnings announcements from the two different systems.

Common law has its origin in England and hence it is found in UK and many former British colonies. Common law is a result of individual action in the private sector. It emphasizes the following legal procedure over rules[16]. Common laws including accounting standards have evolved by being commonly accepted in practise. Private sector bodies codify generally accepted rules and make them binding on their members; such standards arise not in government, but in an accounting market. Thus it can be said that common law enforcement is private matter which involves civil litigation, whereas Code-law originates from collective planning in the public sector. Code-law enforcement is a government function, which involves administrative bodies undertaking criminal prosecution for code violation[17]. The countries following common law accounting system have 'shareholder' corporate governance model in which shareholders alone elect the governing board, while the countries following code law have 'stakeholder' model for resolving information asymmetry by public and private communication. As a result of quicker incorporation of economic losses, accounting income in common-law countries is significantly timelier as compared to code-law countries. In code-law countries information asymmetry is more likely resolved by institutional features other than timely and conservative public financial statements. This is done mostly by major shareholders[18]. One of the major differences between common-law and code-law countries are the manner in which information asymmetry between mangers and potential users of accounting income is resolved. As compared to the common-law countries there is strong political influence on accounting at national and firm levels, in the code-law countries. The Governments in these countries establish and enforce national accounting standards with representation from major political groups such as labour unions, banks and business associations. On the firm level the political influence leads to a 'stakeholder' governance model. Due to this, it can be said that the accounting income is divided among different groups such as dividends to shareholders, taxes to governments and bonuses to managers and employees. The demand for accounting income under code law is influenced more by the payout preferences for labour, capital and government, and

[16] (David and Brierly, 1985, p.24; Posner, 1996)
[17] Ray Ball, S.P Kothari, Ashok Robin, 2000, p.13-14
[18] Ibid.

less by the demand for public disclosure. The groups' agents are represented in corporate governance hence the insider communication solves the information asymmetry between the managers and stakeholders. On the contrary in common-law countries the shareholders elect members of the governing board and hence payouts are less closely linked to current-period accounting income and public disclosure is more likely solution for the information asymmetry problem. The properties of accounting income are determines mostly in the disclosure market[19].

3.4. A broad view of techniques employed in the thesis

This thesis starts with the event study method to examine stock market price's response to the earnings events and in a later part to examine short term and long-term impact of earnings announcements on the bid-ask spreads. This methodology was introduced by Brown and Warner (1985), and subsequently used by Beneish and Gardner (1995); Gregoriou and Ioannidis (2006); Gregoriou (2008) and many others event studies in literature.

Abnormal return (AR) is calculated as difference between individual stock return and market index returns, and then averaged across number of firms in the sample each day t to form average abnormal return (AAR). Average abnormal return AAR is cumulated over interval of k days from day t to t + k for different event windows to obtain Cumulative abnormal return (CAAR). Equally weighted portfolio standard deviation of AAR series is calculated, and t- statistics used to test the hypothesis CAAR = 0.

This research has chosen different short-term event windows as [-1, 1], [-2,2], [-3, 3], [-4, 4]; [-5, 5]; and long-term even windows as [-90,0]; [-80,0]; [-70,0]; ... [-10,0]; [0,10]; [0,20].... [0, 90].

This traditional market model will contain shortcomings inside if the events are clustered[20]. If all of our firms are exposed to earnings announcements at the same time, the abnormal returns for each firm will unlikely be independent due to contemporary correlation of return across firms. However, in my samples, different firms have different earnings announcement dates so abnormal returns are less likely to suffer from correlations. The test for correlation also supports this.

[19] Ibid.
[20] Brown and Warner, 1985.

In this thesis, good and bad news are defined by positive and negative returns over the short-term event window [-5, 1] for the reason that we assume that the news is leaked to the market a couple of days before the official announcement date. The outcome of the positive and negative returns will not be affected by slight changes in the short term window. Pre-earnings announcement period is defined as a period from day -90 to day -1. Post earnings announcements period is defined as a period from day 0 to day +90.

Stock trading volume is calculated as the number of shares traded on the day multiplied by the average of high and low price of that day.

As mentioned in earlier chapters, I have used the three measures of bid ask spread including quote bid ask spread, relative bid ask spread and effective bid ask spread as direct measures of stock market liquidity.

Daily trades and quotes from DATASTREAM Advance database are used to calculate relative bid ask spread and effective bid ask spread.

$$QuoteSpread = BidPrice - AskPrice \tag{3.4.1}$$

The relative bid ask spread is calculated as the difference between bid price and ask price divided by the mid price.

$$Relative\,Spread = \frac{PA - PB}{\frac{PA + PB}{2}} \tag{3.4.2}$$

The effective bid ask spread is calculated as twice as much as the absolute value of the difference between trading price and the mid price.

$$Effective\,Spread = 2\left|P - \frac{PA + PB}{2}\right| \tag{3.4.3}$$

As discussed in the literature chapter, the reason I used all of three measures of bid ask spreads is because large trades are more likely to be executed outside the quoted spreads, so it can be said that quoted spread and relative spread are not an accurate measure, as noted in Roll [1984] and many others. In addition, relative spread and effective spread take into account the mid-price so it ignores price movement leading to mid-price change and the relative and effective spread also change. For this reason it is necessary to take into account the three spread measures in the analysis as well.

While the thesis develops, there are many different regression models employed. There will be empirical specification parts to explain each of the methodology and explanatory variables.

3.5. Descriptive statistics

Table 3.5.1... LSE– Pre-earnings announcements descriptive statistics.

This table presents statistics description of samples of 99 firms listed on the FTSE100, 233 firms listed on the FTSE 250, 310 firms listed on the FTSE Small Cap, and 913 firms listed on FTSE AIM All Shares in the period 90 days before earnings announcement.

Variables	**Stock Price**	**Quoted Spread**	**Relative Spread**	**Effective Spread**	**Market value**	**Trading Volume** [21]	**Stock Return**	**Daily TV per MV**
Unit	*(£)*	*(Pence)*	*(%)*	*(Pence)*	*(Millions £)*	*(1000£)*	*(%)*	*(Per 1000)*
FTSE100								
Pre EA								
Mean	8.64	1.85	0.25	1.27	14077	80995	0.096	7.13
Std. Dev.	6.27	2.18	0.33	1.63	20877	120453	1.43	6.89
Skewness	1.45	3.82	7.53	3.82	2.94	4.14	0.43	19.33
Kurtosis	5.18	25.54	77.32	30.98	12.08	29.41	9.11	883.98
Jarque-Bera	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Post EA								
Mean	9.16	1.84	0.23	1.26	14272	99582	0.058	8.63
Std. Dev.	6.57	2.31	0.30	1.70	20073	13650	1.7	7.54
Skewness	1.48	7.31	9.54	7.88	2.86	3.79	0.24	7.15
Kurtosis	5.34	145.90	156.40	201.70	11.64	25.83	20.12	113.57
Jarque-Bera	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FTSE250								
Pre EA								
Mean	5.38	5.25	0.96	3.15	976	6222	0.012	5.42
Std. Dev.	5.40	12.60	1.5	9.03	597	12261	1.7	7.77
Skewness	3.87	8.32	7.21	11.17	1.29	20.13	-1.33	10.82
Kurtosis	25.21	97.72	92.61	165.86	4.30	972.95	64.57	287.76
Jarque-Bera	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Post EA								
Mean	5.78	4.97	0.86	2.94	1045	7339	0.049	6.07
Std. Dev.	5.58	10.53	1.31	6.77	628	12166	1.90	9.46
Skewness	3.26	6.57	7.23	8.45	1.25	9.03	0.11	20.85
Kurtosis	18.53	65.71	95.38	114.83	4.19	186.83	12.06	862.58
Jarque-Bera	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

(Table 3.5.1. continued on following page)

[21] Stock trading volume is calculated as number of shares traded on the day multiply by the average of high and low price on that day.

Table 3.5.1. continued from preceding page

Variables	Stock Price	Quoted Spread	Relative Spread	Effective Spread	Market value	Trading Volume[22]	Stock Return	Daily TV per MV
Unit	*(£)*	*(Pence)*	*(%)*	*(Pence)*	*(Millions £)*	*(1000£)*	*(%)*	*(Per 1000)*
FTSE Small Cap								
Pre EA								
Mean	3.77	11.41	3.23	4.96	192.61	596.73	0.068	2.72
Std. Dev.	14.85	49.33	4.56	21.54	100.62	2035.33	1.81	8.03
Skewness	15.42	15.08	6.84	18.62	1.51	15.91	-1.32	16.25
Kurtosis	253.56	274.12	99.79	481.52	7.57	438.57	55.97	461.56
Jarque-Bera	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Post EA								
Mean	3.95	11.16	3.12	4.80	200.69	615.47	0.025	2.77
Std. Dev.	15.17	48.18	4.53	21.06	97.52	1860.20	1.86	7.90
Skewness	15.14	15.03	10.16	22.44	1.09	14.42	-0.121	16.56
Kurtosis	244.23	264.72	264.63	715.71	4.96	365.39	19.22	478.30
Jarque-Bera	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FTSE AIM All Shares								
Pre EA								
Mean	0.98	4.38	8.49	0.54	56.81	219.19	-0.020	2.96
Std. Dev.	1.59	10.53	9.51	6.23	111.73	1657.14	3.81	10.03
Skewness	5.83	20.06	3.46	57.91	6.55	37.33	0.70	17.04
Kurtosis	60.63	1068.39	22.18	6733.29	62.89	2339.11	100.24	522.86
Jarque-Bera	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Post EA								
Mean	1.01	4.23	8.32	0.43	59.30	193.78	-0.060	2.98
Std. Dev.	1.66	8.84	9.42	4.02	109.75	1157.63	4.26	11.59
Skewness	6.44	10.03	3.32	36.50	6.04	26.76	-2.76	31.07
Kurtosis	79.65	144.25	18.68	2357.18	54.20	1115.64	295.14	1910.69
Jarque-Bera	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

London Stock Exchanges

Table 3.5.1 presents descriptive statistics for final samples of 99 firms listed in FTSE100, 233 firms listed in FTSE250, 310 firms listed in FTSE Small Cap and 913 firms listed in FTSE AIM All Shares in pre-earnings announcements period. We witness that FTSE100 companies are large firms with high market liquidity because of the high market value and low relative bid-ask spreads. In fact, these firms account for

[22] Stock trading volume is calculated as number of shares traded on the day multiply by the average of high and low price on that day.

about 81% market value of the whole London stock exchange. Daily trading volume per market value is also evidence of high liquidity. Firms listed in FTSE250 are medium firms. The stocks are still of high liquidity but less if compared to FTSE100 firms with the relative higher bid-ask spreads. In addition, the large daily trading volume per market value is evidence of high liquidity of stocks, but this number is lower than in FTSE100 firms. Firms listed in FTSE Small Cap are smaller than in the above two indices with lower market value. The bid-ask spreads is relatively higher than the above two indices, this suggests low liquidity. The daily trading volume per market value is lower than the above two indices but still a high number compared to the stock price. Stocks of these firms are illiquid. Finally, companies listed in FTSEAIM All Shares are small firms with low market value. The high relative bid-ask spread is evidence of illiquidity. In addition, the low daily trading volume per share is another evidence of illiquidity.

American Stock Exchanges

Table 3.5.2 presents descriptive statistics for final samples of 30 firms listed in DJIA, 96 firms listed in NASDAQ100 and 100 firms listed in S&P100 in pre-earnings announcements period. We observe that firms in DJIA are large and the stocks are of high liquidity because of the high market value and low bid-ask spreads. In addition, high daily trading volume per market value is also evidence of high liquidity. Statistics also show that the NASDAQ100 are large firms with high market value in the US stock exchanges. The low bid-ask spread indicates high liquidity of stocks. Another evidence of high liquidity is daily trading volume per market value, relatively high compared to the stock prices. Finally, firms in the S&P100 index are also large firms. Low bid-ask spreads are indicators of stocks with high liquidity. Moreover, the daily trading volume per market value is relatively high compared to the stock prices. This is further evidence of high liquidity.

Paris Bourse

Table 3.5.3 presents descriptive statistics for final samples of 40 firms listed in CAC40 in pre-earnings announcements period. Some of these observations are interesting. High market values suggest that the CAC40 firms are large and low quoted bid-ask spreads shows that the stocks are liquid. Additionally, liquidity of firms stock is reflected by high daily trading volume per market value.

Table 3.5.2 The U.S. Stock Exchanges – Pre-earnings announcements descriptive statistics.

This table presents statistics description of samples of 30 firms listed on the DJIA, 96 firms listed on the NASDAQ 100, 100 firms listed on the S&P100 in the period 90 days before earnings announcement.

Variables	Stock Price	Quoted Spread	Relative Spread	Effective Spread	Market value	Trading Volume	Stock Return	Daily TV per MV
Unit	*($US)*	*(cents)*	*(%)*	*(cents)*	*(Millions)$*	*($1000)*	*(%)*	*(per 1000)*
DJIA								
Pre EA								
Mean	49.45	3.41	0.070	2.30	133162	607129	0.075	5.62
Std. Dev.	18.34	3.07	0.057	3.25	96176	582951	1.16	6.12
Skewness	0.55	14.36	12.67	13.02	1.32	7.33	-1.87	10.07
Kurtosis	2.55	440.50	377.40	334.74	4.61	135.68	26.26	185.29
Jarque-Bera	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Post EA								
Mean	52.22	3.45	0.067	2.38	140793	684247	0.101	6.06
Std. Dev.	19.13	2.52	0.048	2.88	98981	495393	1.14	4.99
Skewness	0.58	3.88	8.20	9.82	1.20	2.13	0.28	4.85
Kurtosis	2.81	41.79	185.82	221.00	4.23	10.07	7.95	44.07
Jarque-Bera	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NASDAQ100								
Pre EA								
Mean	44.56	1.80	0.048	3.85	20181	274136	0.069	15.07
Std. Dev.	51.70	2.87	0.061	7.60	32709	505879	1.96	14.32
Skewness	6.61	5.18	0.56	39.51	4.17	6.77	-0.13	4.79
Kurtosis	54.12	95.03	11.51	2485.73	24.98	106.08	14.63	54.51
Jarque-Bera	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Post EA								
Mean	44.54	2.33	0.061	3.47	20885	285698	0.072	15.08
Std. Dev.	50.35	3.04	0.064	4.42	35775	545093	1.95	14.31
Skewness	6.47	3.59	0.61	7.65	4.43	6.10	0.15	5.88
Kurtosis	53.52	44.68	15.33	119.22	27.14	64.49	20.91	73.99
Jarque-Bera	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
S&P100								
Pre EA								
Mean	54.32	3.72	0.076	2.90	73509	419912	0.091	7.22
Std. Dev.	49.40	3.54	0.056	5.10	74930	524184	1.238	7.96
Skewness	6.39	6.42	4.88	14.22	2.24	5.72	-0.45	6.23
Kurtosis	53.80	122.46	133.44	407.54	9.13	85.25	13.70	79.33
Jarque-Bera	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Post EA								
Mean	56.78	3.90	0.077	3.11	76167	489259	0.087	8.18
Std. Dev.	49.89	4.12	0.162	6.94	76876	560221	1.32	7.73
Skewness	5.89	11.63	75.90	44.10	2.15	4.60	-0.041	4.27
Kurtosis	47.79	352.76	6593	2988	8.65	45.96	12.00	35.27
Jarque-Bera	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 3.5.3. CAC40– Pre-earnings announcements descriptive statistics.

This table presents statistics description of samples of 40 firms listed on the CAC40 in the period 90 days before earnings announcement.

	Stock Price	**Quoted Spread**	**Relative Spread**	**Effective Spread**	**Market value**	**Trading Volume**	**Stock Return**	**Daily TV per MV**
	(€)	*(Cents)*	*(%)*	*(Cents)*	*(Millions €)*	*(1000€)*	*(%)*	*(Per 1000)*
CAC40								
Pre EA								
Mean	64.28	6.04	0.089	5.48	32283	126724	0.101	4.77
Std. Dev.	41.83	8.74	0.107	8.21	27535	121315	1.34	3.68
Skewness	1.45	11.11	23.36	12.87	1.68	3.05	0.16	4.43
Kurtosis	5.22	230.20	785.55	294.45	5.64	18.36	6.59	42.03
Jarque-Berra	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Post EA								
Mean	70.02	3.98	0.058	3.63	35023	159508	0.090	5.41
Std. Dev.	46.37	6.37	0.056	5.97	28849	156920	1.47	3.92
Skewness	1.50	5.92	2.41	6.31	1.61	3.66	0.26	3.54
Kurtosis	5.57	60.94	11.57	71.48	5.37	28.20	6.22	28.12
Jarque-Berra	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

CHAPTER IV

IMPACTS OF EARNING ANNOUNCEMENT ON STOCK LIQUIDITY – UNIVARIATE ANALYSIS

Earnings announcement is a major event of information at public level that captures stock market risk because the information contained strongly affects investor's decisions. It has been observed that investors tend to trade more heavily and frequently around earnings announcement. As mentioned previously, stock liquidity refers to the ability to trade the stock quickly at any time with lowest price impact. It is an important characteristic that every investor looks for when trading in the market. Given the importance of earnings information, in this chapter I would like to explore the impact of earnings announcements on the stock market liquidity. This chapter has three objectives. First is to examine evidence of PEAD and price reaction to the earnings announcements on different stock exchanges. It is interesting that this is the first study to carry out an analysis on the London Stock Exchange as a whole, with comparison of other important indices from the US and French markets, and by the separation of the large, medium and small securities. Second objective of this thesis is to explore the trading volume effect in both short term and long term of earnings announcement. Finally I would like to apply information cost liquidity hypothesis, which was first established in 1970 by Van Horn. Given the possibility of an alternative information environment after earnings announcements, I examine whether there is increase/decrease in market liquidity following the announcement.

The next layout is as follows. Section 4.1 describes the methodology and investigates the stock prices response to earnings announcement. Section 4.2 explores the trading volume effect of earnings announcements. Section 4.3 is the application of information cost hypothesis around earnings announcements inorder to explore if there is any possible change in liquididty due to the news. Finally, section 4.4 concludes remarks.

4.1. Stock Price response to the earnings announcements.

4.1.1. Empirical design

In this section I have split sample into good news and bad news groups. As mentioned in the above chapter, good news and bad news firms are defined by positive and negative returns respectively over the short event window period [-5, 1], for the reason that we assume information has been leaked to the market a couple of day before the event and up to day + 1 markets already have enough time to recognize the news direction. In fact the results will not change if we vary this window. For each group, I used standard event study method for a window of 181 days around earnings announcements date [-90; +90]. The stock price reaction to the earnings announcements around the event date 0 was analysed using the market adjusted model of abnormal returns, which is the difference between rates of return of individual stock and rate of return of the index due to its simplicity and popularity. This market-adjusted model (or constant mean return model) follow Brown and Warner (1985)[23] and subsequent researchers for example Hedge and McDermott (2003) and Gregoriou (2006). In fact, Brown and Warner find that the simple mean returns model often yields sresults similar to those more sophisticated models because the variance of the abnormal returns is not reduced much by choosing a more sotisphicated model.

$$AR_{it} = R_{it} - R_{mt} \qquad (4.1.1.1)$$

Where,

- R_{it} is rate of return of stock i on day t, $R_{it} = \ln P_{it} - \ln P_{i(t-1)}$.
- R_{mt} is rate of return of the index on day t $R_{mt} = \ln PI_t - \ln PI_{(t-1)}$. It is value weighted market return of the index.

---

[23] Brown and Warner (1980, 1985) find that the simple mean returns model often yields results similar to those of more sophisticated models because the variance of abnormal returns is not reduced much by choosing a more sophisticated model.
For each stock i, the market adjusted model assumes that stock returns are given by

$$R_{i,t} = E[R_{i;t} | X_t] + \xi_{i,t},$$

Where

$$E[R_{i;t} | X_t] = \mu,$$
$$E[\xi_{i,t}] = 0 \text{ and } Var[\xi_{i,t}] = \sigma_{\xi,i}^2$$

The abnormal returns AR_{it} then are averaged across the number of firms in the sample on each day t to form an average excess returns, AAR_t.

For the purpose of testing the reaction, AAR_t are cumulated from day 0 through intervals of k days, k = 10, 20, 30, ...90, and k = -10, -20, -30 ....-90 to test the short run and long run effect of earnings announcements on the stock market. We also cumulate 10 days around earnings announcements.

$$CAAR_{t,k} = \sum_{t=0}^{k} AAR_t \qquad (4.1.1.2)$$

The variance of the sample is obtained by the following formula:

$$S_{AAR}^{2} = \frac{1}{180}\sum_{t=-90}^{90}(AAR_t - \overline{AAR_t})^2 \qquad (4.1.1.3)$$

Where,

- $\overline{AAR}$ is the mean of average excess returns AAR_t for 181 trading day period.

If there is no reaction, CAAR will follow normal contribution.

$$CAAR_{t,\, t+k} \sim N\,(0,\, \sigma 2t_{,\, t+k}) \qquad (4.1.1.4)$$

The t statistic used to test the hypothesis CAAR equal the zero is calculated as:

$$t - statistic = \frac{CAAR_{t,t+k}}{\sqrt{(k+1)S_{AAR}^{2}}} \qquad (4.1.1.5)$$

The t-statistics for all indices are presented in 8 tables in the following part. The short-term effect around a five-day event window [-5, +5] is presented in Panel A. Long term effects for up to 90 days following earnings announcement is presented in Panel B by each 10-day interval. The result shows significant positive stock price reactions to the good news earnings announcements, and significant negative stock price reaction to the bad news earnings announcements for all indices. Notice that good and bad news are defined by positive and negative returns over the short-term event window [-5, 1]. I assume there is leakage of information before the news. In fact we could vary this window but there is not much change in the result. As witnessed, liquidity effects occur for all indices in the short term, and persist longer in the long term for good news firms than for the bad news firms. This happens as we would expect, the reaction occur until the news has ended its effects on stock prices. All of the tables and graph also show that the increases or decreases in price are permanent, i.e. after the change, the price does not go back down or up from the original level.

4.1.2. Results and explanations

4.1.2.1. FTSE100.

The graph of cumulative abnormal returns (CAAR) from day -90 up to day +90 for FTSE100 is presented in figure 4.1.2.1. We can see that there is upper trend in pre-event period for both good and bad news, this trend continues after the event, probably due to impact of some available market conditions. The good news[24] reaction shows an upward trend while bad news[25] downward reaction last only for a short while then continues its original trend.

Meanwhile, CAAR test results for FTSE100 presented in table 4.1.2.1 indicate that stock returns of firms included in FTSE100 are significantly affected by the earnings announcements, not only after but also before the event.

Before Event

For good news the t-values are mostly insignificant pre earnings announcements as we can see from table 4.1.2.1 Panel A and Panel B probably there is no previous reaction before the news is released. T-statistics in the short term are 1.43 for the window frame [-3, -1], 0.74 for [-2,-1] and 0.23 for [-1,-1]. T-statistics for long term are 1.35 for the window frame [-40,-1], 1.21 for [-30,-1] and 1.00 for [-20,-1].

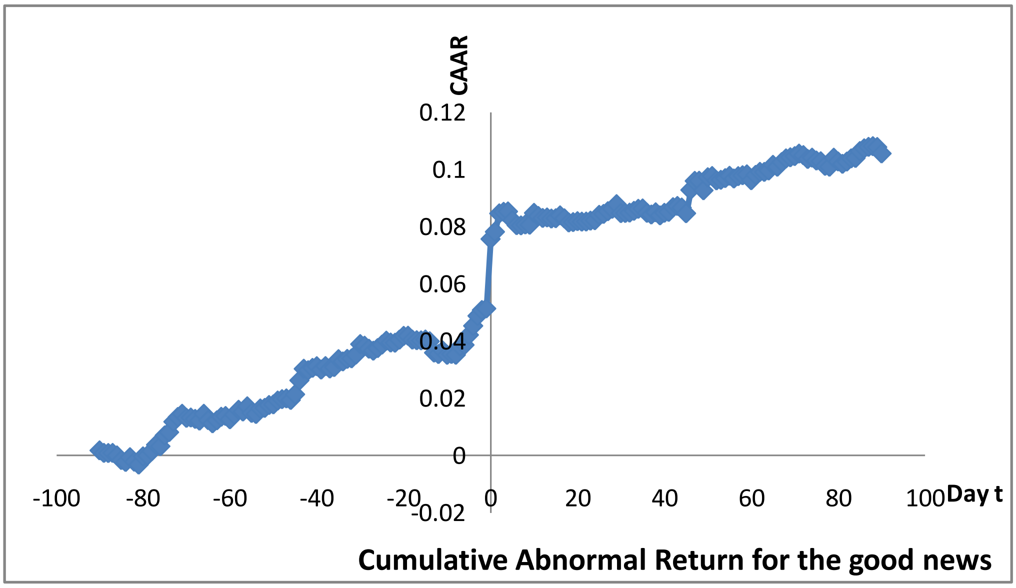
For the bad news t-values are totally insignificant in the short term period, as we can see in table 4.1.2.1 Panel A. T-statistics are -1.08 for the window frame [-5,-1], 0.13 for [-3,-1], -0.48 for [-2,-1] and -0.80 for [-1,-1]. T-statistics for long term are 1.51 for the window frame [-80,-1], 0.93 for [-50,-1] and 0.39 for [-10,-1] in panel B.

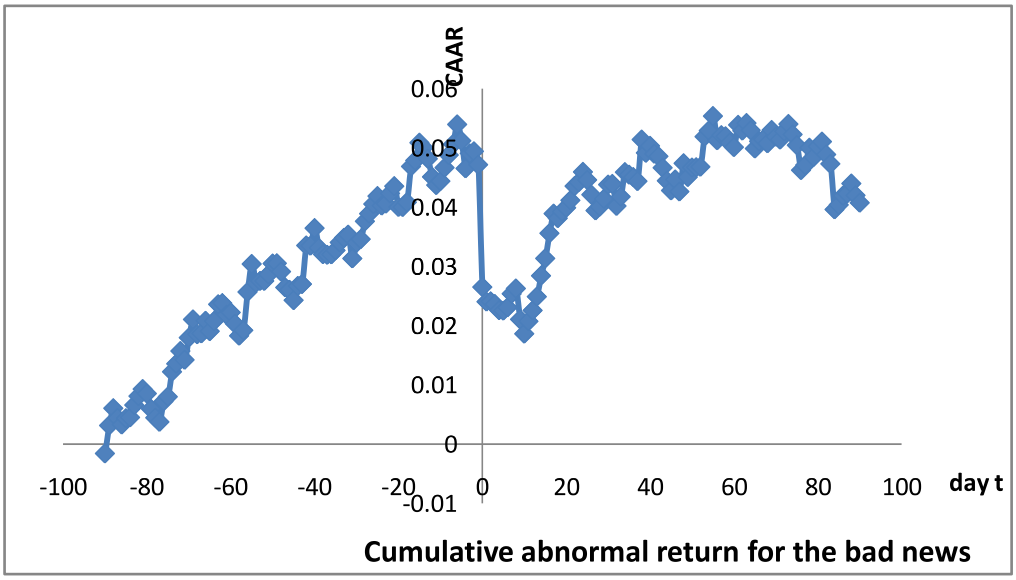
After Event

For good news the t-values are strongly significant as we can see from table 4.1.2.1 Panel A and Panel B. T statstics in the short term are 7.79 for the time frame [1, 0], 6.93 for [3, 0] and is 6.23 for [4, 0]. T-statistics for long term are 4.14 for the time frame [10, 0], 2.14 for [40, 0] and 2.59 for [70, 0].

[24] Good news are defined by positive returns over the short term event window [-5,1]
[25] Bad news are defined by negative returns over the short term event window [-5,1]

Figure 4.1.2.1 FTSE 100- Aggregate price reaction after earnings announcement[26]





For bad news t-values are strongly significant in the short term, as we can see in table 4.1.2.1 Panel A. T statistics are -5.82 for the time frame [1, 0], -4.74 for [2, 0] and -3.58 for [5, 0]. T statistics for the long term are -0.56 for the window frame [20, 0], 0.18 for [40, 0] and 0.20 for [70, 0] in panel B.

Overall there are positive reactions happening for the good news and negative reaction for bad news. The largest abnormal return occurred on the event day 0 with t statistic

[26] From figure 4.1.2.1 to 4.1.2.8, good and bad news are defined by positive and negative returns over the short-term event window [-5,1], see footnotes 20&21.

Table 4.1.2.1-Abnormal Returns around FTSE100 index earnings announcements

The sample consists of 99 stocks listed on FTSE100 index. Cumulative average abnormal returns CAAR are computed using the market model and the standard event study methodology. The estimation window for computing the market model parameters is the event time interval [-90, 90]. CAAR is tested for significance using t-statistics.

Panel A. Short-term Abnormal Returns

GOOD NEWS[27]			BAD NEWS[28]		
Event day	CAAR	t-statistic	Event day	CAAR	t-statistic
[-5, -1]	0.013	2.33***	[-5, -1]	-0.007	-1.08
[-4, -1]	0.009	1.89*	[-4, -1]	-0.004	-0.72
[-3, -1]	0.006	1.43	[-3, -1]	0.001	0.13
[-2, -1]	0.003	0.74	[-2, -1]	-0.002	-0.48
[-1, -1]	0.001	0.23	[-1, -1]	-0.002	-0.80
[0, 0]	0.024	9.98***	[0, 0]	-0.021	-7.35***
[1, 0]	0.027	7.79***	[1, 0]	-0.023	-5.82***
[2, 0]	0.033	7.88***	[2, 0]	-0.023	-4.74***
[3, 0]	0.034	6.93***	[3, 0]	-0.024	-4.19***
[4, 0]	0.034	6.23***	[4, 0]	-0.025	-3.91***
[5, 0]	0.031	5.18***	[5, 0]	-0.025	-3.58***

Panel B. Long-term Abnormal Returns

GOOD NEWS			BAD NEWS		
Event day	CAAR	t-statistic	Event day	CAAR	t-statistic
[-90, -1]	0.051	2.23**	[-90, -1]	0.047	1.77*
[-80, -1]	0.055	2.50***	[-80, -1]	0.038	1.51
[-70, -1]	0.037	1.81*	[-70, -1]	0.033	1.40
[-60, -1]	0.038	1.99**	[-60, -1]	0.025	1.16
[-50, -1]	0.034	1.96**	[-50, -1]	0.019	0.93
[-40, -1]	0.021	1.35	[-40, -1]	0.014	0.77
[-30, -1]	0.016	1.21	[-30, -1]	0.016	1.03
[-20, -1]	0.011	1.00	[-20, -1]	0.004	0.29
[-10, -1]	0.015	1.91*	[-10, -1]	0.003	0.39
[10, 0]	0.033	4.14***	[10, 0]	-0.029	-3.06***
[20, 0]	0.030	2.73***	[20, 0]	-0.007	-0.56
[30, 0]	0.033	2.46***	[30, 0]	-0.003	-0.21
[40, 0]	0.033	2.14**	[40, 0]	0.003	0.18
[50, 0]	0.046	2.64***	[50, 0]	0.000	-0.02
[60, 0]	0.045	2.36***	[60, 0]	0.003	0.13
[70, 0]	0.053	2.59***	[70, 0]	0.005	0.20
[80, 0]	0.051	2.34***	[80, 0]	0.003	0.12
[90, 0]	0.054	2.33***	[90, 0]	-0.006	-0.24

* Significant at 10% level
** Significant at 5% level
*** Significant at 1% level

for the good news firms equal 9.98, and for bad news firms is -7.35. Moreover, there is evidence of abnormal return persisting over the long term, especially for good news

[27] From table 4.1.2.1 to 4.1.2.8, good news are defined by positive returns over the short-term event window [-5,1], see footnotes 20

[28] From table 4.1.2.1 to 4.1.2.8, bad news are defined by negative returns over the short-term event window [-5,1], see footnotes 21

firms. However, bad news reaction ends more quickly. The reaction is considerably more expressive on the good news firms and stock prices continue to react while bad news stock prices go back to equilibrium in a shorter time frame. Since there is significant price response to the earnings news, there is possibility of change in liquidity due to the announcement.

4.1.2.2 FTSE250.

The graph of cumulative abnormal returns (CAAR) from day -90 up to day +90 for FTSE250 is presented in figure 4.1.2.2 the good news reaction shows an upward trend while bad news reaction shows a downward trend. The prices increase (and decrease) after the earnings announcement is permanent in the studied event time frame. After the event shock, stock returns continue the original trend without getting back to the previous levels.

Test result for FTSE250 in table 4.1.2.2 indicates that stock returns of the firms included in the index are significantly affected by the earnings announcements. There is significant change before and after the event date.

Before Event

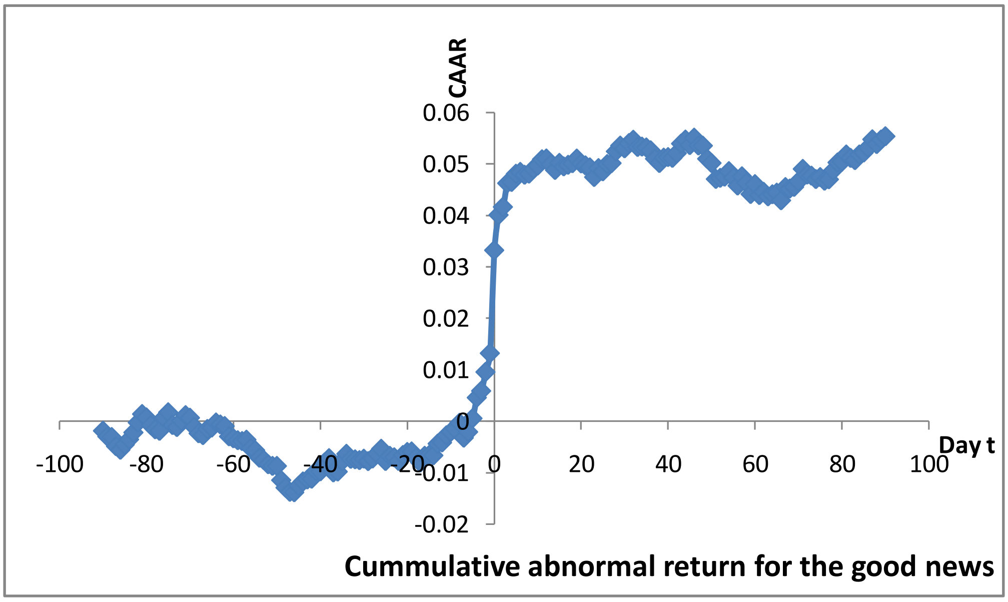
For good news the t-values are mostly significant in pre earnings announcements as we can see from table 4.1.2.2 Panel A and Panel B. The t-statistics in the short term before the event are strongly significant. T-statistics in the short term are 1.78 for the window frame [-1, -1], 2.53 for [-2,-1] and 2.43 for [-3,-1]. As we can see from the table the t-statistics in the long term are mostly significant. T-statistics for long term are 2.47 for the time frame [-10,-1], 1.85 for [-30,-1] and 1.51 for [-50,-1]. For the bad news t-values are totally insignificant in the short term period, as we can see in table 4.1.21.2 Panel A. T-statistics are -2.23 for the window frame [-2,-1], -3.00 for [-3,-1] and -03.05 for [-4,-1]. T-statistics for bad news for long term before the announcement are 0.22 for [-20,-1], 0.66 for [-30,-1] and 0.29 for [-50,-1] in panel B.

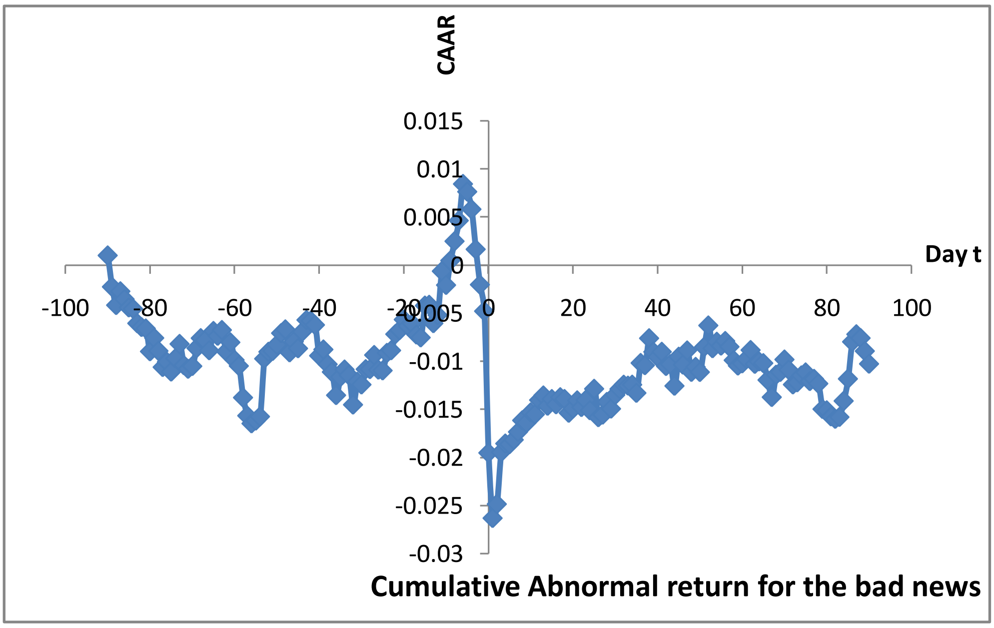
After Event

For good news the t-values are strongly significant as we can see from table 4.1.2.2 Panel A and Panel B. The t-statistics for good news in the short term are mostly significant. T statstics in the short term are 9.28 for the time frame [1, 0], 8.07 for [3, 0] and is 7.26 for [4, 0]. As we can see from table 4.1.2.2 Panel B, the t-statistics are mostly significant. T-statistics for long term are 5.37 for the time frame [10, 0], 2.91 for [40, 0] and 1.94 for the time frame [70, 0].

For bad news after the event t-values are strongly significant in the short term, as we can see in table 4.1.2.1 Panel A. T statistics in the short term are -7.46 for the time frame [1, 0], -5.68 for [2, 0] and -2.77 for [5, 0]. The t-statistics in the long term are totally insignificant. T statistics for bad news in the the long term are -1.08 for the time frame [20, 0], -0.36 for the time frame [40, 0] and -0.44 for the time frame [50, 0] in panel B.

Figure 4.1.2.2 FTSE 250- Aggregate Price reaction after earnings announcement





FTSE 250 includes medium sized companies and the stock is less liquid as compared to FTSE 100. For this reason it is understood that the reaction is less. Compared to FTSE 100, there is lot of evidence that prices react in pre-announcement period for FTSE 250. There is no reaction for bad news in the long term.

Table 4.1.2.2-Aggregate Abnormal Returns around FTSE250 index earnings announcements

The sample consists of 233 stocks listed on FTSE250 index with data available. Cumulative average abnormal returns CAAR are computed using the market model and the standard event study methodology. The estimation window for computing the market model parameters is the event time interval [-90, 90]. CAAR is tested for significance using t-statistics.

Panel A. Short-term Abnormal Returns

GOOD NEWS			BAD NEWS		
Event day	CAAR	t-statistic	Event day	CAAR	t-statistic
[-5, -1]	0.015	3.34***	[-5, -1]	-0.013	-2.90***
[-4, -1]	0.013	3.09***	[-4, -1]	-0.012	-3.05***
[-3, -1]	0.009	2.43***	[-3, -1]	-0.011	-3.00***
[-2, -1]	0.007	2.53***	[-2, -1]	-0.006	-2.23**
[-1, -1]	0.004	1.78*	[-1, -1]	-0.003	-1.35
[0, 0]	0.020	9.77***	[0, 0]	-0.015	-7.23***
[1, 0]	0.027	9.28***	[1, 0]	-0.022	-7.46***
[2, 0]	0.028	8.02***	[2, 0]	-0.020	-5.68***
[3, 0]	0.033	8.07***	[3, 0]	-0.015	-3.60***
[4, 0]	0.033	7.26***	[4, 0]	-0.014	-3.02***
[5, 0]	0.035	6.95***	[5, 0]	-0.014	-2.77***

Panel B. Long-term Abnormal Returns

GOOD NEWS			BAD NEWS		
Event day	CAAR	t-statistic	Event day	CAAR	t-statistic
[-89, -1]	0.015	0.78	[-89, -1]	-0.006	-0.30
[-80, -1]	0.012	0.65	[-80, -1]	0.002	0.10
[-70, -1]	0.012	0.70	[-70, -1]	0.006	0.35
[-60, -1]	0.016	1.02	[-60, -1]	0.003	0.21
[-50, -1]	0.022	1.51	[-50, -1]	0.004	0.29
[-40, -1]	0.023	1.77*	[-40, -1]	0.001	0.11
[-30, -1]	0.021	1.85*	[-30, -1]	0.007	0.66
[-20, -1]	0.020	2.16**	[-20, -1]	0.002	0.22
[-10, -1]	0.016	2.47***	[-10, -1]	-0.004	-0.65
[10, 0]	0.036	5.37***	[10, 0]	-0.011	-1.56
[20, 0]	0.037	3.93***	[20, 0]	-0.010	-1.08
[30, 0]	0.040	3.49***	[30, 0]	-0.009	-0.77
[40, 0]	0.038	2.91***	[40, 0]	-0.005	-0.36
[50, 0]	0.037	2.53***	[50, 0]	-0.006	-0.44
[60, 0]	0.033	2.05**	[60, 0]	-0.005	-0.34
[70, 0]	0.033	1.94*	[70, 0]	-0.005	-0.29
[80, 0]	0.037	2.02**	[80, 0]	-0.010	-0.56
[90, 0]	0.042	2.16**	[90, 0]	-0.005	-0.28

* Significant at 10% level
** Significant at 5% level
*** Significant at 1% level

Overall there are positive reactions happening for the good news and negative reaction for bad news. The largest abnormal returns happen on day 0 with t statistic equal to 9.77 for good news firms and on day 1 with t statistic is -7.46 for bad news firms. For long term, stock prices continue to change after earnings announcements until the end of 90 day for good news firms. There is no reaction for bad news firms in the long term as the bad news ends quickly. Possibly there is a liquidity effect caused by earnings announcements for the good news company in the long term.

4.1.2.3 FTSE Small Cap

Figure 4.1.2.3 shows the price reaction to the earnings announcements for stocks in the FTSE Small Cap. Cumulative abnormal returns for good news stocks have an upward trend while a downward trend for bad news firms. The graph also shows that for this index of less liquid stocks, cumulative abnormal returns drift further than compared to the other two above indices. This is consistent with what literature documented.

Test result for the FTSE Small Cap indicates that stock returns of firms included in the index are significantly affected by the earnings announcements; there is significant change before and after the event date.

Before Event

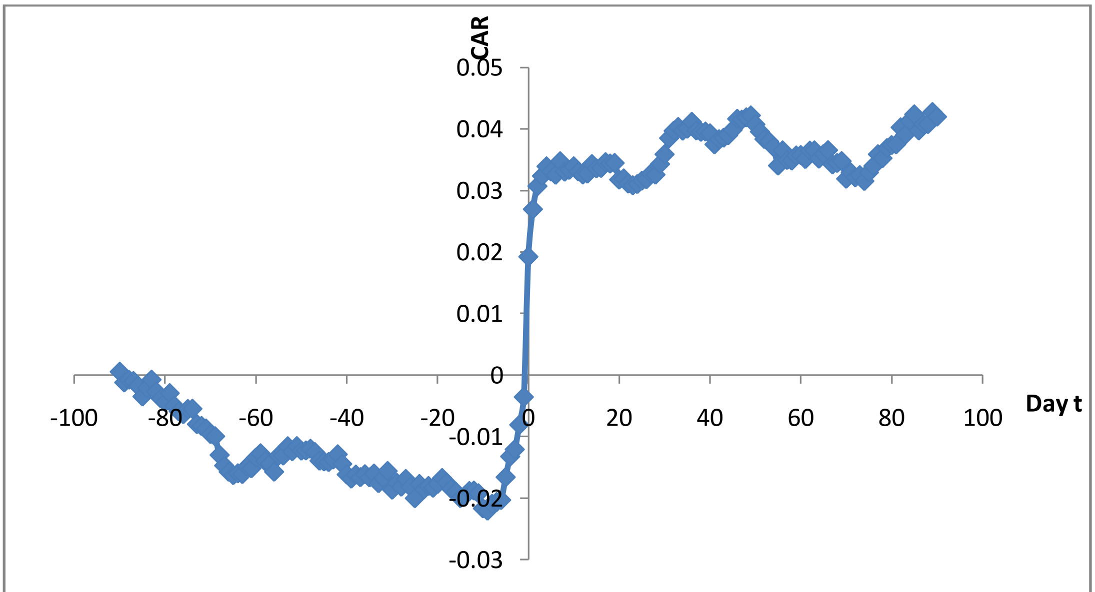
For good news the t-values are totally significant in the short term in pre earnings announcements as we can see from table 4.1.2.3 Panel A. T-statistics in the short term are 2.91 for the window frame [-4, -1], 2.69 for [-2,-1] and 2.02 for [-1,-1]. For the t-statistics in the long term there is no significant change in the stock returns. T-statistics for long term are 0.77 for the window frame [-40,-1], 0.98 for [-30,-1] and 1.47 for [-20,-1].

For the bad news t-values are totally significant in the short term period, as we can see in table 4.1.2.3 Panel A. T-statistics are -3.33 for the window frame [-5,-1], -2.57 for [-3,-1], -2.19 for [-2,-1] and -0.66 for [-1,-1]. The t-statistics in the long term for bad news show no significant changes in the stock returns. T-statistics for long term are 0.75 for the window frame [-80,-1], 1.28 for [-50,-1] and -0.62 for [-10,-1]

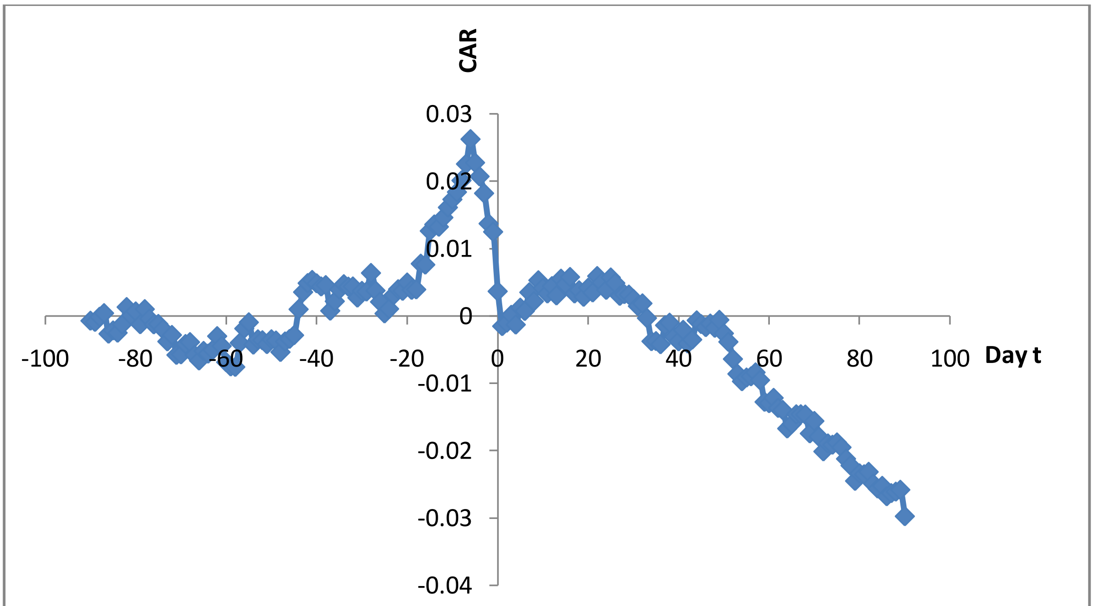
After Event

For good news the t-values are strongly significant as we can see from table 4.1.2.3 Panel A and Panel B. The t-statistics in the short term after the announcement are mostly significant. T statstics in the short term are 9.64 for the time frame [1, 0], 8.02 for [3, 0] and is 7.49 for [4, 0]. The t-statistics after the announcement are strongly significant. T-statistics for long term are 5.05 for the time frame [10, 0], 2.99 for [40, 0] and 1.88 for [70, 0].

Figure 4.1.2.3. FTSE Small Cap- Aggregate Price reaction after earnings announcement



Cumulative abnormal return for the good news



Cumulative abnormal return for the bad news

For bad news t-values are strongly significant in the short term, as we can see in table 4.1.2.3 Panel A. T statistics in the short term are -5.37 for the time frame [1, 0], -4.23

Table 4.1.2.3- Aggregate Abnormal Returns around FTSE Small Cap index earnings announcements

The sample consists of 310 stocks listed on FTSE Small Cap index with data available. Cumulative average abnormal returns CAAR are computed using the market model and the standard event study methodology. The estimation window for computing the market model parameters is the event time interval [-90, 90]. CAAR is tested for significance using t-statistics.

Panel A. Short-term Abnormal Returns

GOOD NEWS			BAD NEWS		
Event day	CAAR	t-statistic	Event day	CAAR	t-statistic
[-5, -1]	0.017	3.34***	[-5, -1]	-0.014	-3.33***
[-4, -1]	0.013	2.91***	[-4, -1]	-0.010	-2.78***
[-3, -1]	0.010	2.49***	[-3, -1]	-0.008	-2.57***
[-2, -1]	0.009	2.69***	[-2, -1]	-0.006	-2.19**
[-1, -1]	0.005	2.02**	[-1, -1]	-0.001	-0.66
[0, 0]	0.023	10.18***	[0, 0]	-0.009	-4.79***
[1, 0]	0.031	9.64***	[1, 0]	-0.014	-5.37***
[2, 0]	0.034	8.84***	[2, 0]	-0.014	-4.23***
[3, 0]	0.036	8.02***	[3, 0]	-0.012	-3.34***
[4, 0]	0.037	7.49***	[4, 0]	-0.014	-3.34***
[5, 0]	0.037	6.68***	[5, 0]	-0.011	-2.49***

Panel B. Long-term Abnormal Returns

GOOD NEWS			BAD NEWS		
Event day	CAAR	t-statistic	Event day	CAAR	t-statistic
[-90, -1]	-0.004	-0.17	[-90, -1]	0.013	0.72
[-80, -1]	0.000	0.01	[-80, -1]	0.012	0.75
[-70, -1]	0.005	0.27	[-70, -1]	0.018	1.18
[-60, -1]	0.012	0.67	[-60, -1]	0.017	1.19
[-50, -1]	0.008	0.51	[-50, -1]	0.017	1.28
[-40, -1]	0.011	0.77	[-40, -1]	0.007	0.61
[-30, -1]	0.012	0.98	[-30, -1]	0.010	0.97
[-20, -1]	0.015	1.47	[-20, -1]	0.009	1.06
[-10, -1]	0.016	2.21**	[-10, -1]	-0.004	-0.62
[10, 0]	0.037	5.05***	[10, 0]	-0.008	-1.36
[20, 0]	0.035	3.44***	[20, 0]	-0.008	-0.98
[30, 0]	0.039	3.16***	[30, 0]	-0.010	-0.97
[40, 0]	0.043	2.99***	[40, 0]	-0.016	-1.38
[50, 0]	0.044	2.77***	[50, 0]	-0.015	-1.14
[60, 0]	0.039	2.25**	[60, 0]	-0.025	-1.77*
[70, 0]	0.035	1.88*	[70, 0]	-0.028	-1.81*
[80, 0]	0.041	2.03**	[80, 0]	-0.036	-2.16**
[90, 0]	0.046	2.13**	[90, 0]	-0.042	-2.40**

* Significant at 10% level
** Significant at 5% level
*** Significant at 1% level

for [2, 0] and -2.49 for [5, 0]. The t-statistics for bad news in the long term show no significant changes except in the end of the study period. T statistics for the long term are -0.98 for [20, 0], -1.38 for [40, 0] and -1.81 for [70, 0].

Similar to FTSE 250, for FTSE Small Cap there is reaction in the pre-announcement period for both good and bad news in the short term. There is no significant change in the long term for bad news. The reactions are significant for both the news in the short term. In the long term pre and post event there is no reaction for the bad news.

Overall there are positive reactions happening for the good news and negative reaction for bad news. The largest average abnormal return is on the event day 0 for good news firms and on day 1 for bad news firms with t statistic is 10.18 and -5.37 in the short term respectively. For long term, stock prices continue to drift after earnings announcements up to 90 days post announcement for good news firms; however there is no significanct evidence of price reaction for the bad news firms after 5 days. There is possibility of change in liquidity due to the announcement, especially with good news firms.

4.1.2.4. FTSE AIM All Shares

In the Figure 4.1.2.4, cumulative abnormal returns for good news firms show an upward trend and a downward trend for bad news firms. However bad news firm's reaction does not last for a longer time.

Test results for the FTSE AIM All Shares in table 4.1.2.4 indicate that there is evidence of market price changes around earnings announcements

Before Event

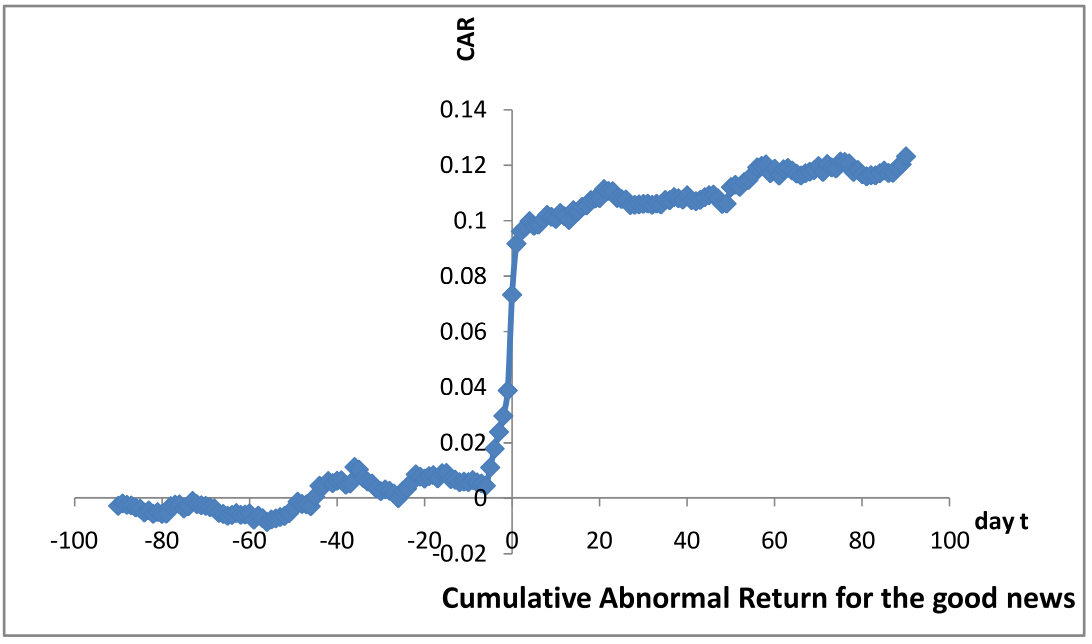
For good news the t-values are totally significant in the short term in pre earnings announcements as we can see from table 4.1.2.4 Panel A. T-statistics in the short term are 4.05 for the window frame [-4, -1], 3.08 for [-2,-1] and 2.68 for [-1,-1]. The t-statistics in the long term before the event are mostly significant as we can see from the Panel B. T-statistics for long term before the event are 1.54 for the window frame [-40,-1], 1.89 for [-30,-1] and 2.03 for [-20,-1].

For the bad news t-values are mostly significant in the short term period, as we can see in table 4.1.2.4 Panel A. T-statistics are -3.64 for the window frame [-5,-1], -2.65 for [-3,-1] and -1.71 for [-2,-1]. The t-statistics in the long term for bad news show no significant changes in the stock return. T-statistics for long term are 0.54 for the window frame [-80,-1], 0.36 for [-50,-1] and -1.18 for [-10,-1] in panel B.

After Event

For good news the t-values are strongly significant as we can see from table 4.1.2.3 Panel A and Panel B. The t-statistics in the short term after the announcement are

Figure 4.1.2.4. FTSEAIM All Shares- Aggregate Price reaction after earnings announcement



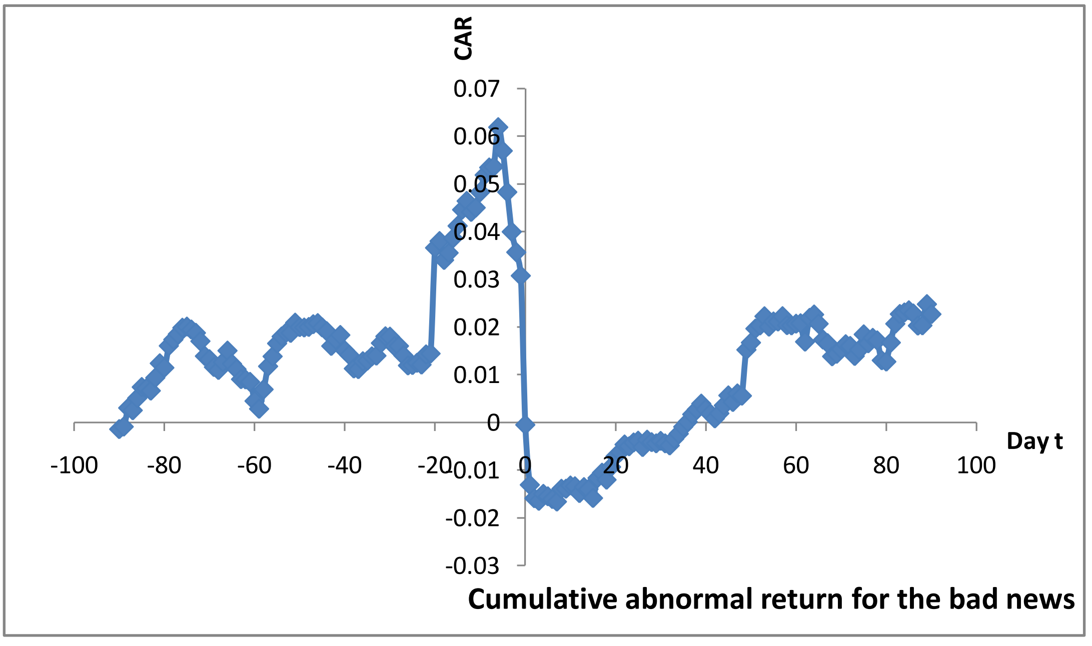


Table 4.1.2.4- Aggregate Abnormal Returns around FTSEAIM All Shares index earnings announcements

The sample consists of 913 stocks listed on FTSE AIM All Shares index with data available. Cumulative average abnormal returns CAAR are computed using the market model and the standard event study methodology. The estimation window for computing the market model parameters is the event time interval [-90, 90]. CAAR is tested for significance using t-statistics.

Panel A. Short-term Abnormal Returns

GOOD NEWS			BAD NEWS		
Event day	CAAR	t-statistic	Event day	CAAR	t-statistic
[-5, -1]	0.034	4.48***	[-5, -1]	-0.031	-3.64***
[-4, -1]	0.028	4.05***	[-4, -1]	-0.026	-3.42***
[-3, -1]	0.021	3.54***	[-3, -1]	-0.018	-2.65***
[-2, -1]	0.015	3.08***	[-2, -1]	-0.009	-1.71*
[-1, -1]	0.009	2.68***	[-1, -1]	-0.005	-1.29
[0, 0]	0.034	10.08***	[0, 0]	-0.031	-8.18***
[1, 0]	0.053	10.93***	[1, 0]	-0.044	-8.11***
[2, 0]	0.057	9.67***	[2, 0]	-0.047	-7.05***
[3, 0]	0.059	8.60***	[3, 0]	-0.047	-6.17***
[4, 0]	0.061	7.97***	[4, 0]	-0.046	-5.35***
[5, 0]	0.059	7.08***	[5, 0]	-0.046	-4.94***

Panel B. Long-term Abnormal Returns

GOOD NEWS			BAD NEWS		
Event day	CAAR	t-statistic	Event day	CAAR	t-statistic
[-90, -1]	0.039	1.19	[-90, -1]	0.031	0.85
[-80, -1]	0.044	1.43	[-80, -1]	0.018	0.54
[-70, -1]	0.041	1.44	[-70, -1]	0.017	0.53
[-60, -1]	0.045	1.69*	[-60, -1]	0.022	0.75
[-50, -1]	0.044	1.83*	[-50, -1]	0.010	0.36
[-40, -1]	0.033	1.54	[-40, -1]	0.012	0.51
[-30, -1]	0.035	1.89*	[-30, -1]	0.013	0.61
[-20, -1]	0.031	2.03**	[-20, -1]	0.016	0.95
[-10, -1]	0.033	3.03***	[-10, -1]	-0.014	-1.18
[10, 0]	0.062	5.45***	[10, 0]	-0.044	-3.47***
[20, 0]	0.069	4.42***	[20, 0]	-0.038	-2.16***
[30, 0]	0.067	3.53***	[30, 0]	-0.035	-1.63
[40, 0]	0.070	3.21***	[40, 0]	-0.028	-1.14
[50, 0]	0.073	3.00***	[50, 0]	-0.014	-0.51
[60, 0]	0.080	2.99***	[60, 0]	-0.010	-0.34
[70, 0]	0.081	2.80***	[70, 0]	-0.015	-0.48
[80, 0]	0.078	2.53***	[80, 0]	-0.018	-0.52
[90, 0]	0.084	2.58***	[90, 0]	-0.008	-0.22

* Significant at 10% level
** Significant at 5% level
*** Significant at 1% level

mostly significant. T statstics in the short term are 10.93 for the time frame [1, 0], 8.60 for [3, 0] and is 7.97 for [4, 0]. The t-statistics after the announcement in the long term are strongly significant. T-statistics for long term are 5.45 for the time frame [10, 0], 3.21 for [40, 0] and 2.80 for [70, 0].

For bad news t-values are strongly significant in the short term, as we can see in table 4.1.2.4 Panel A. T statistics in the short term are -8.11 for the time frame [1, 0], -7.05 for [2, 0] and -4.94 for [5, 0]. The t-statistics for bad news in the long term show significant changes upto twenty days after the event day. T statistics for the long term are -2.16 for the window frame [20, 0], -1.14 for [40, 0] and -0.48 for [70, 0].

After the shock of the news, cumulative abnormal returns continue the original trend, at the new level. Compared to other indices, for FTSE Small Cap there is reaction for the news in *both* pre and post announcement periods.

Overall there are positive reactions happening for the good news and negative reaction for bad news. The largest abnormal returns happen on day 1 and day 0 with t statistics equal to 10.93 and -8.18 for good news and bad news firms respectively. Earnings announcements does change the stock returns significantly in the long term for good news and this effect lasts until day 90. However, for bad news firms, the effects end after much shorter time frame.

4.1.2.5 DJIA

Figure 4.1.2.5 shows the cumulative abnormal return reaction for DJIA. Though there is some volatility, the good news firm has an upward trend and bad news firm has a downward trend.

Test results for the DJIA in Table 4.1.2.5 indicates that stock returns of firms included in the DJIA are strongly affected by the earnings announcements.

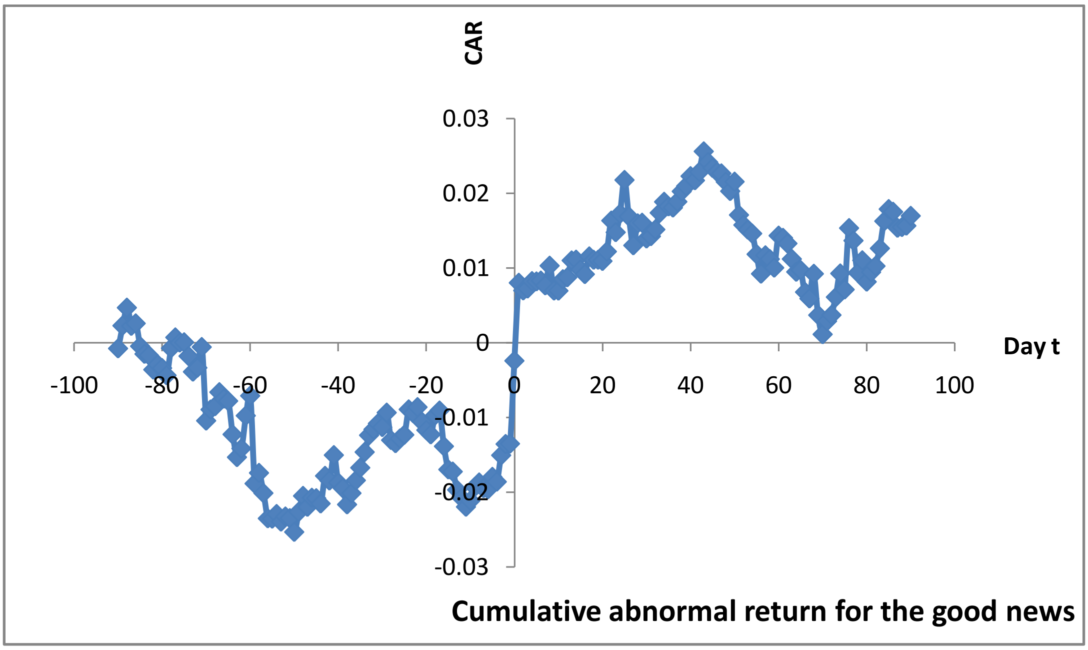
Before Event

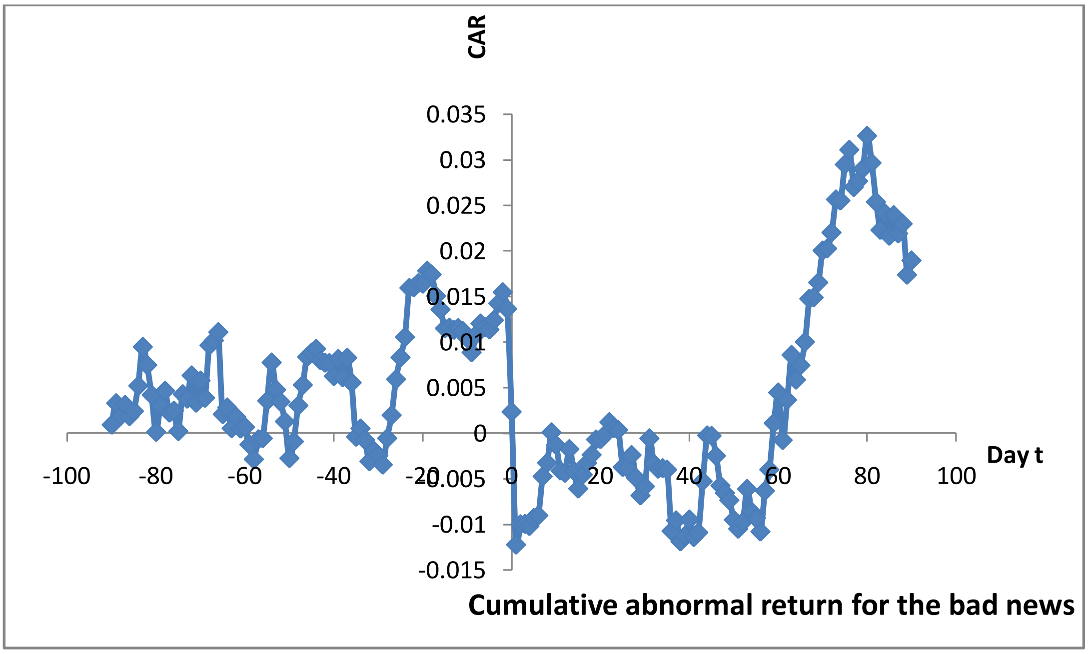
For good news the t-values are totally insignificant in the short term in pre earnings announcements as we can see from table 4.1.2.5 Panel A. T-statistics in the short term are 0.84 for the window frame [-4, -1], 0.41 for [-2,-1] and 0.02 for [-1,-1]. The t-statistics in the long term before the event are totally insignificant as we can see from the Panel B. T-statistics for long term before the event are -0.45 for the window frame [-80,-1], -0.19 for [-30,-1] and -0.25 for [-20,-1].

For the bad news t-values are mostly insignificant in the short term period, as we can see in table 4.1.2.5 Panel A. T-statistics are 0.31 for the window frame [-5,-1], 0.25 for

[-3,-1] and -0.14 for [-2,-1]. In panel B, the t-statistics in the long term for bad news show no significant changes in the stock return. T-statistics for long term are 0.36 for the window frame [-80,-1], 0.60 for [-50,-1] and 0.27 for [-10,-1].

Figure 4.1.2.5. DJIA- Aggregate Price reaction after earnings announcement





After Event

For good news the t-statistics in the short term after the announcement are mostly significant. T statstics in the short term are 5.75 for the time frame [1, 0], 3.92 for [3, 0] and is 3.68 for [4, 0]. The t-statistics after the announcement in the long term are mostly significant. T-statistics for long term are 2.33 for the time frame [10, 0], 2.11 for [40, 0] and 0.66 for [70, 0].

Table 4.1.2.5- Aggregate Abnormal Returns around DJIA index earnings announcements

The sample consists of 40 stocks listed on DJIA index. Cumulative average abnormal returns CAAR are computed using the market model and the standard event study methodology. The estimation window for computing the market model parameters is the event time interval [-90, 90]. CAAR is tested for significance using t-statistics.

Panel A. Short-term Abnormal Returns

GOOD NEWS			BAD NEWS		
Event day	CAAR	t-statistic	Event day	CAAR	t-statistic
[-5, -1]	0.006	1.03	[-5, -1]	0.002	0.31
[-4, -1]	0.004	0.84	[-4, -1]	0.002	0.39
[-3, -1]	0.005	1.11	[-3, -1]	0.001	0.25
[-2, -1]	0.002	0.41	[-2, -1]	-0.001	-0.14
[-1, -1]	0.000	0.02	[-1, -1]	-0.002	-0.62
[0, 0]	0.011	4.19***	[0, 0]	-0.011	-3.89***
[1, 0]	0.022	5.75***	[1, 0]	-0.026	-6.29***
[2, 0]	0.021	4.47***	[2, 0]	-0.024	-4.69***
[3, 0]	0.021	3.92***	[3, 0]	-0.024	-4.06***
[4, 0]	0.022	3.68***	[4, 0]	-0.024	-3.66***
[5, 0]	0.022	3.35***	[5, 0]	-0.023	-3.22***

Panel B. Long-term Abnormal Returns

GOOD NEWS			BAD NEWS		
Event day	CAAR	t-statistic	Event day	CAAR	t-statistic
[-90, -1]	-0.014	-0.54	[-90, -1]	0.014	0.49
[-80, -1]	-0.011	-0.45	[-80, -1]	0.009	0.36
[-70, -1]	-0.013	-0.58	[-70, -1]	0.010	0.42
[-60, -1]	-0.004	-0.18	[-60, -1]	0.013	0.58
[-50, -1]	0.010	0.53	[-50, -1]	0.012	0.60
[-40, -1]	0.002	0.09	[-40, -1]	0.006	0.32
[-30, -1]	-0.003	-0.19	[-30, -1]	0.016	0.98
[-20, -1]	-0.003	-0.25	[-20, -1]	-0.003	-0.22
[-10, -1]	0.008	1.01	[-10, -1]	0.002	0.27
[10, 0]	0.020	2.33***	[10, 0]	-0.015	-1.55
[20, 0]	0.024	2.02**	[20, 0]	-0.014	-1.07
[30, 0]	0.027	1.86*	[30, 0]	-0.020	-1.20
[40, 0]	0.036	2.11**	[40, 0]	-0.023	-1.24
[50, 0]	0.035	1.86*	[50, 0]	-0.023	-1.11
[60, 0]	0.028	1.35	[60, 0]	-0.009	-0.40
[70, 0]	0.015	0.66	[70, 0]	0.006	0.26
[80, 0]	0.022	0.91	[80, 0]	0.019	0.72
[90, 0]	0.031	1.21	[90, 0]	0.005	0.19

* Significant at 10% level
** Significant at 5% level
*** Significant at 1% level

For bad news t-values are strongly significant in the short term, as we can see in table 4.1.2.5 Panel A. T statistics in the short term are -6.29 for the time frame [1, 0], -4.69 for [2, 0] and -3.22 for [5, 0]. The t-statistics for bad news after the announcement period show no reaction at all .T statistics for the long term are -1.07 for the window frame [20, 0], -1.24 for [40, 0] and 0.26 for [70, 0].

Overall, similarly as other previous indices, stock prices drift significantly after earnings announcement, as t value reject null hypothesis. Largest abnormal return happened on day 1 for both news with t statistic is 5.75 for good news firms and is – 6.29 for bad news firms. There is evidence of change in liquidity in the short term for both types of news; however, the evidence of abnormal returns happens only for good news up to 50 days post earnings announcement. In addition, as expected, many firms in the US have earnings announcement at the end of the day after market close, and that is the reason why it has been observed that the reaction is most significantly on the day 1 instead of day 0 as in the UK.

4.1.2.6 NASDAQ100

Figure 4.1.2.6 shows the cumulative abnormal returns for the firms in the NASDAQ100. Good news stocks reaction has an upward trend while bad news stock reaction has a downward trend.

Test results in table 4.1.2.6 indicate that average abnormal return significantly changed after the earnings announcement event in the short term event windows.

Before Event

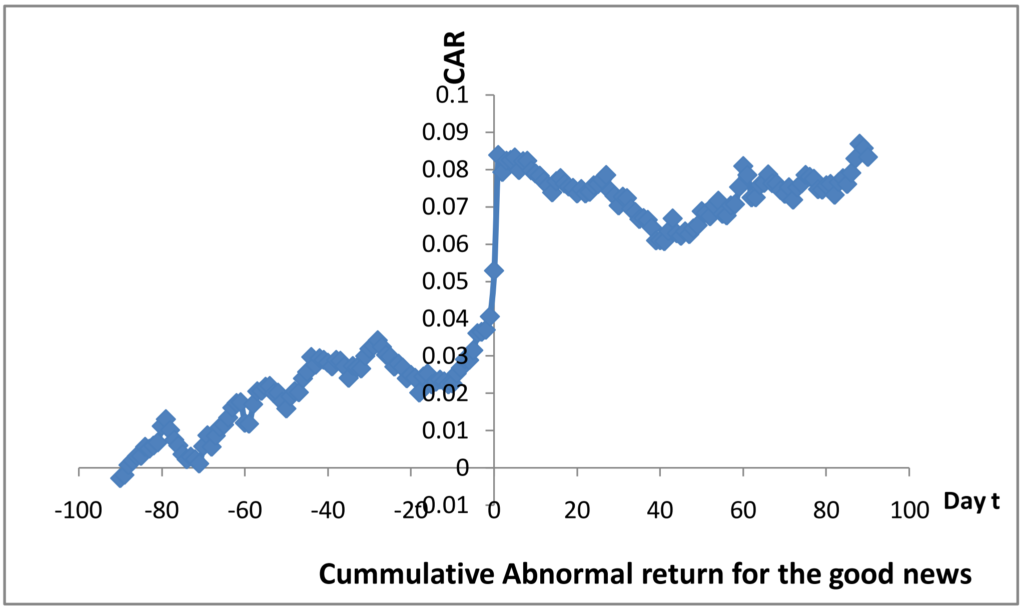
For good news the t-values are totally insignificant in the short term in pre earnings announcements as we can see from table 4.1.2.6 Panel A. T-statistics in the short term are 1.36 for the window frame [-4, -1], 0.88 for [-2,-1] and 1.08 for [-1,-1]. For the t-statistics in the long term before the event there is no significant change in stock return. T-statistics for long term are 1.42 for the window frame [-70,-1], 0.55 for [-40,-1] and 1.73 for [-10,-1].

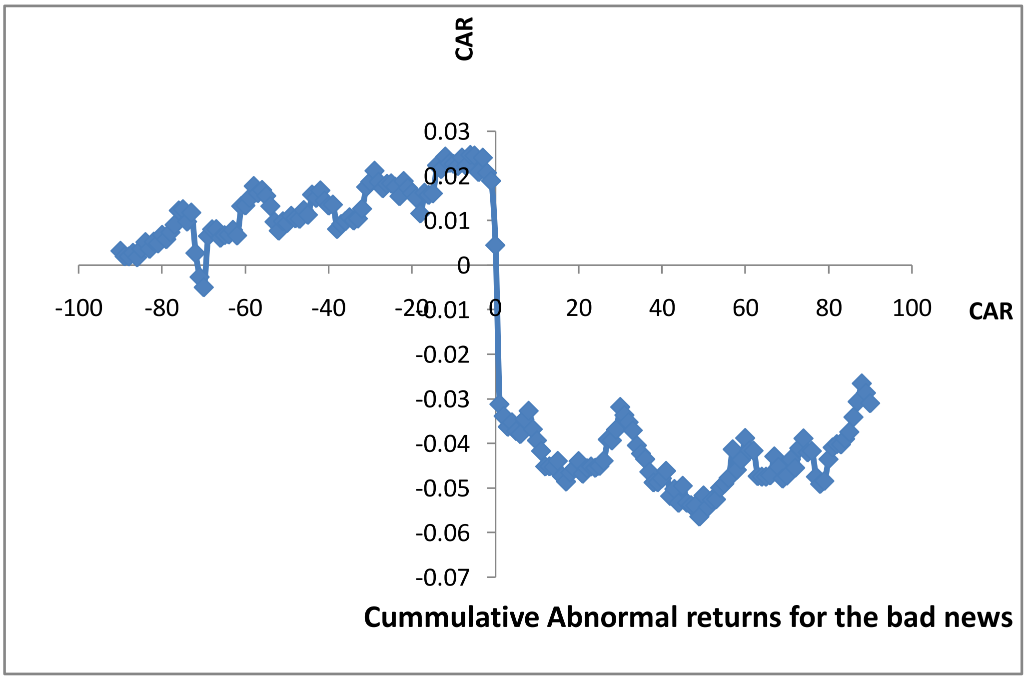
For the bad news t-values are totally insignificant in the short term period, as we can see in table 4.1.2.6 Panel A. T-statistics are -0.66 for the window frame [-5,-1], -0.29 for [-3,-1] and -0.46 for [-1,-1]. The t-statistics in the long term for bad news show no significant changes in the stock return. T-statistics for long term are 0.40 for the window frame [-80,-1], 0.32 for [-50,-1] and -0.32 for [-10,-1]

After Event

For good news the t-statistics in the short term after the announcement are mostly significant. T statstics in the short term are 9.19 for the time frame [1, 0], 6.27 for [3, 0] and is 5.63 for [4, 0]. The t-statistics after the announcement in the long term show no significant changes except for upto 20 days after the event. T-statistics for long term are 3.47 for the time frame [10, 0], 0.96 for [40, 0] and 1.17 for [70, 0].

Figure 4.1.2.6. NASDAQ100- Aggregate Price reaction after earnings announcement





For bad news t-values are strongly significant in the short term, as we can see in table 4.1.2.6 Panel A. T statistics in the short term are -8.97 for the time frame [1, 0], -7.71 for [2, 0] and -5.80 for [5, 0]. The t-statistics for bad news in the long term show significant changes. T statistics for the long term are -3.47 for [20, 0], -2.64 for [40, 0] and -1.99 for [70, 0].

Table 4.1.2.6. - Aggregate Abnormal Returns around NASDAQ100 index earnings announcements

The sample consists of 96 stocks listed on NASDAQ100 index with data available. Cumulative average abnormal returns CAAR are computed using the market model and the standard event study methodology. The estimation window for computing the market model parameters is the event time interval [-90, 90]. CAAR is tested for significance using t-statistics.

Panel A. Short-term Abnormal Returns

	GOOD NEWS			BAD NEWS	
Event day	CAAR	t-statistic	Event day	CAAR	t-statistic
[-5, -1]	0.012	1.57	[-5, -1]	-0.006	-0.66
[-4, -1]	0.009	1.36	[-4, -1]	-0.006	-0.72
[-3, -1]	0.004	0.78	[-3, -1]	-0.002	-0.29
[-2, -1]	0.004	0.88	[-2, -1]	-0.005	-0.93
[-1, -1]	0.004	1.08	[-1, -1]	-0.002	-0.46
[0, 0]	0.012	3.69***	[0, 0]	-0.014	-3.65***
[1, 0]	0.043	9.19***	[1, 0]	-0.050	-8.97***
[2, 0]	0.039	6.71***	[2, 0]	-0.053	-7.71***
[3, 0]	0.042	6.27***	[3, 0]	-0.055	-6.98***
[4, 0]	0.042	5.63***	[4, 0]	-0.054	-6.13***
[5, 0]	0.043	5.22***	[5, 0]	-0.056	-5.80***

Panel B. Long-term Abnormal Returns

	GOOD NEWS			BAD NEWS	
Event day	CAAR	t-statistic	Event day	CAAR	t-statistic
[-90, -1]	0.041	1.28	[-90, -1]	0.019	0.50
[-80, -1]	0.034	1.13	[-80, -1]	0.014	0.40
[-70, -1]	0.039	1.42	[-70, -1]	0.022	0.65
[-60, -1]	0.023	0.89	[-60, -1]	0.006	0.18
[-50, -1]	0.023	0.97	[-50, -1]	0.009	0.32
[-40, -1]	0.012	0.55	[-40, -1]	0.004	0.18
[-30, -1]	0.011	0.58	[-30, -1]	0.001	0.06
[-20, -1]	0.017	1.11	[-20, -1]	0.002	0.09
[-10, -1]	0.018	1.73	[-10, -1]	-0.004	-0.32
[10, 0]	0.038	3.47***	[10, 0]	-0.058	-4.44***
[20, 0]	0.033	2.16**	[20, 0]	-0.063	-3.47***
[30, 0]	0.030	1.60	[30, 0]	-0.051	-2.31**
[40, 0]	0.020	0.96	[40, 0]	-0.067	-2.64***
[50, 0]	0.028	1.19	[50, 0]	-0.071	-2.50***
[60, 0]	0.040	1.55	[60, 0]	-0.058	-1.87*
[70, 0]	0.033	1.17	[70, 0]	-0.066	-1.99**
[80, 0]	0.035	1.17	[80, 0]	-0.062	-1.76*
[90, 0]	0.043	1.35	[90, 0]	-0.050	-1.32

* Significant at 10% level
** Significant at 5% level
*** Significant at 1% level

Overall, the largest abnormal return happens on day 1 with t statistic being 9.19 for good news firms and -8.97 for bad news firms. Similarly as explained above in the DJIA index, most of the US firms hold earnings announcement presentation at the end of the day after market close, therefore we expect the largest effects on day 1 unlikely

firms in the UK, the strongest effect happens on the same day with earnings announcements. In the long term, there is also evidence of price response to earnings announcements. However, these are high tech firms so that there could be less weight for the good news on the earnings announcements, and more weight on the bad news as we can see from the significance of t value in both groups.

4.1.2.7 S&P100

The figure 4.1.2.7 shows that good news stock in the S&P100 has an upward reaction meanwhile bad news stocks have a downward reaction.

The results in table 4.1.2.7 for the S&P 100 index indicates significant change of average abnormal returns due to earnings announcements.

Before Event

There is little evidence that for good news prices react before the event in the short term. T-statistics in the short term showing reactions are 2.76 for the window frame [-5, -1] and 2.07 for [-4,-1]. The t-statistics showing no significant reaction three days before the event are 1.55 for the time frame [-3,-1], 0.55 for [-2,-1] and 0.48 for [-1,-1]. The t-statistics in the long term before the event show no significant reaction except for ten days prior to the event day. T-statistics for long term are 0.53 for the window frame [-70,-1], 0.43 for [-40,-1] and 2.43 for [-10,-1].

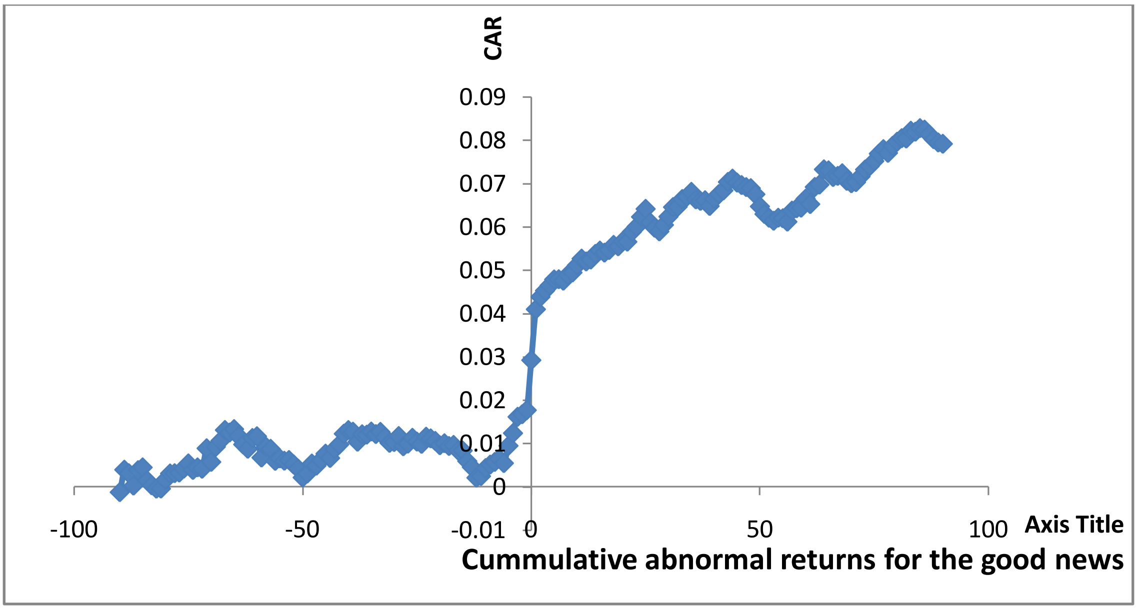
For the bad news t-values are totally insignificant in the short term period, as we can see in table 4.1.2.7 Panel A and Panel B. T-statistics is -0.33 for the window frame [-5,-1], -0.63 for [-3,-1] and -0.58 for [-1,-1]. The t-statistics in the long term for bad news show no significant changes in the stock returns. T-statistics for long term are 0.54 for the window frame [-80,-1], 0.17 for [-50,-1] and -0.20 for [-10,-1].

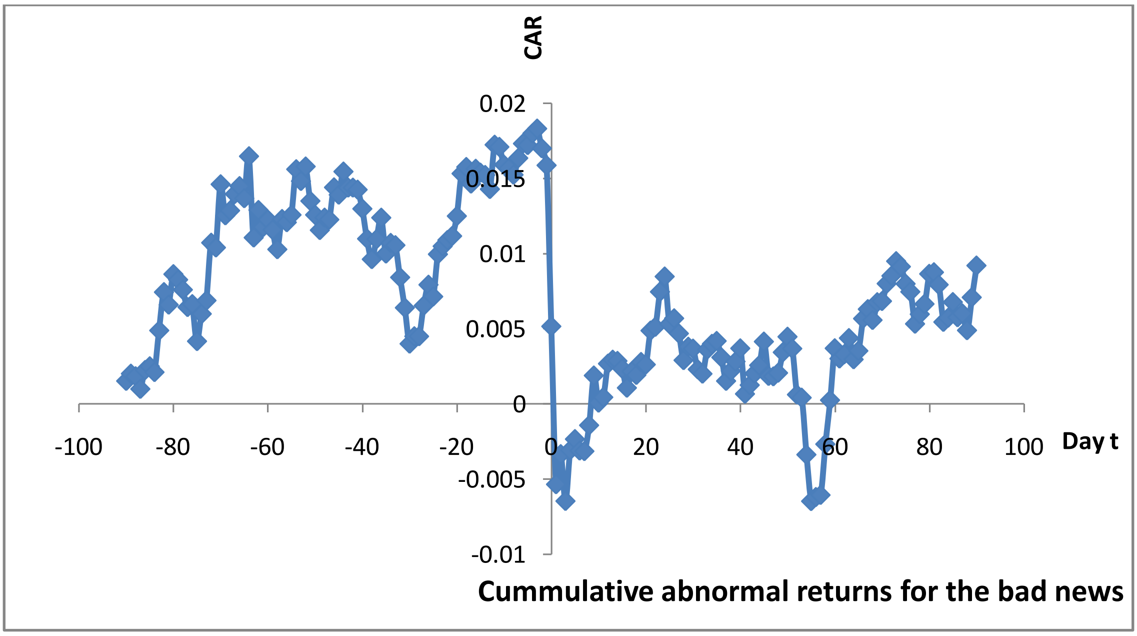
After Event

For good news the t-statistics in the short term after the announcement are mostly significant for both short and long term. T statstics in the short term are 8.31 for the time frame [1, 0], 6.69 for [3, 0] and is 6.49 for [4, 0]. The t-statistics after the announcement in the long term are strongly significant. T-statistics for long term are 5.09 for the time frame [10, 0], 3.32 for [40, 0] and 3.14 for [70, 0].

For bad news t-values are strongly significant in the short term, as we can see in table 4.1.2.7 Panel A. T statistics in the short term are -7.76 for the time frame [1, 0], -5.74 for [2, 0] and -3.84 for [5, 0]. The t-statistics for bad news in the long term show no significant changes. T statistics for the long term are -1.50 for [20, 0], -0.98 for [40, 0] and -0.55 for [70, 0].

Figure 4.1.2.7. S&P100- Aggregate Price reaction after earnings announcement





Overall, the largest abnormal returns happen on day 1 with t statistic for good news firm is 8.31 and for bad news firms is-7.76. There is significant positive abnormal return that persists over the long term for good news firms but for bad news firms this ends very quickly.

Table 4.1.2.7- Aggregate Abnormal Returns around S&P100 index earnings announcements

The sample consists of 100 stocks listed on S&P100 index. Cumulative average abnormal returns CAAR are computed using the market model and the standard event study methodology. The estimation window for computing the market model parameters is the event time interval [-90, 90]. CAAR is tested for significance using t-statistics.

Panel A. Short-term Abnormal Returns

	GOOD NEWS			BAD NEWS	
Event day	CAAR	t-statistic	Event day	CAAR	t-statistic
[-5, -1]	0.012	2.76***	[-5, -1]	-0.001	-0.33
[-4, -1]	0.008	2.07**	[-4, -1]	-0.001	-0.35
[-3, -1]	0.005	1.55	[-3, -1]	-0.002	-0.63
[-2, -1]	0.002	0.55	[-2, -1]	-0.002	-0.89
[-1, -1]	0.001	0.48	[-1, -1]	-0.001	-0.58
[0, 0]	0.012	5.83***	[0, 0]	-0.011	-5.54***
[1, 0]	0.023	8.31***	[1, 0]	-0.021	-7.76***
[2, 0]	0.026	7.62***	[2, 0]	-0.019	-5.74***
[3, 0]	0.028	6.96***	[3, 0]	-0.022	-5.77***
[4, 0]	0.029	6.49***	[4, 0]	-0.019	-4.38***
[5, 0]	0.030	6.22***	[5, 0]	-0.018	-3.84***

Panel B. Long-term Abnormal Returns

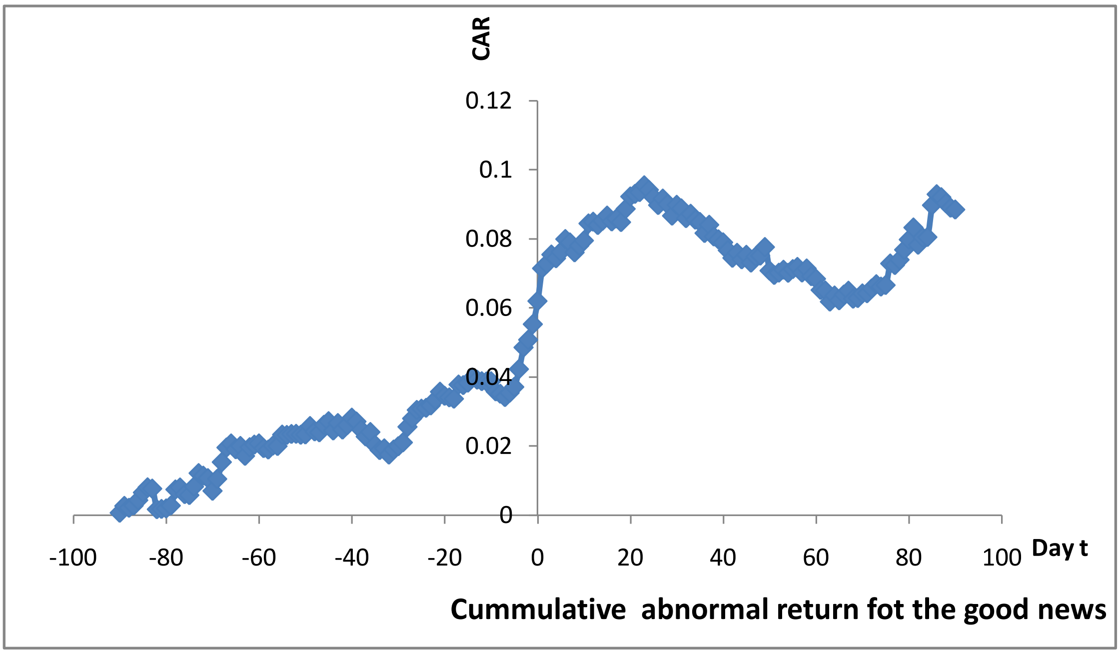
	GOOD NEWS			BAD NEWS	
Event day	CAAR	t-statistic	Event day	CAAR	t-statistic
[-90, -1]	0.018	0.94	[-90, -1]	0.016	0.86
[-80, -1]	0.018	1.02	[-80, -1]	0.009	0.54
[-70, -1]	0.009	0.53	[-70, -1]	0.005	0.34
[-60, -1]	0.006	0.42	[-60, -1]	0.004	0.27
[-50, -1]	0.014	0.96	[-50, -1]	0.002	0.17
[-40, -1]	0.005	0.43	[-40, -1]	0.002	0.13
[-30, -1]	0.008	0.70	[-30, -1]	0.009	0.89
[-20, -1]	0.007	0.80	[-20, -1]	0.005	0.54
[-10, -1]	0.015	2.43***	[-10, -1]	-0.001	-0.20
[10, 0]	0.033	5.09***	[10, 0]	-0.016	-2.46***
[20, 0]	0.039	4.30***	[20, 0]	-0.013	-1.50
[30, 0]	0.045	4.05***	[30, 0]	-0.012	-1.13
[40, 0]	0.049	3.84***	[40, 0]	-0.012	-0.98
[50, 0]	0.047	3.32***	[50, 0]	-0.011	-0.83
[60, 0]	0.049	3.15***	[60, 0]	-0.012	-0.81
[70, 0]	0.052	3.14***	[70, 0]	-0.009	-0.55
[80, 0]	0.062	3.47***	[80, 0]	-0.007	-0.41
[90, 0]	0.062	3.25***	[90, 0]	-0.007	-0.36

* Significant at 10% level
** Significant at 5% level
*** Significant at 1% level

4.1.2.8 CAC40

Figure 4.1.2.8 shows the cumulative abnormal returns for firms in CAC40 index. Cumulative abnormal returns for good news firms have an upward trend while for bad news firms have a downward trend.

Figure 4.1.2.8. CAC40- Aggregate Price reaction after earnings announcement



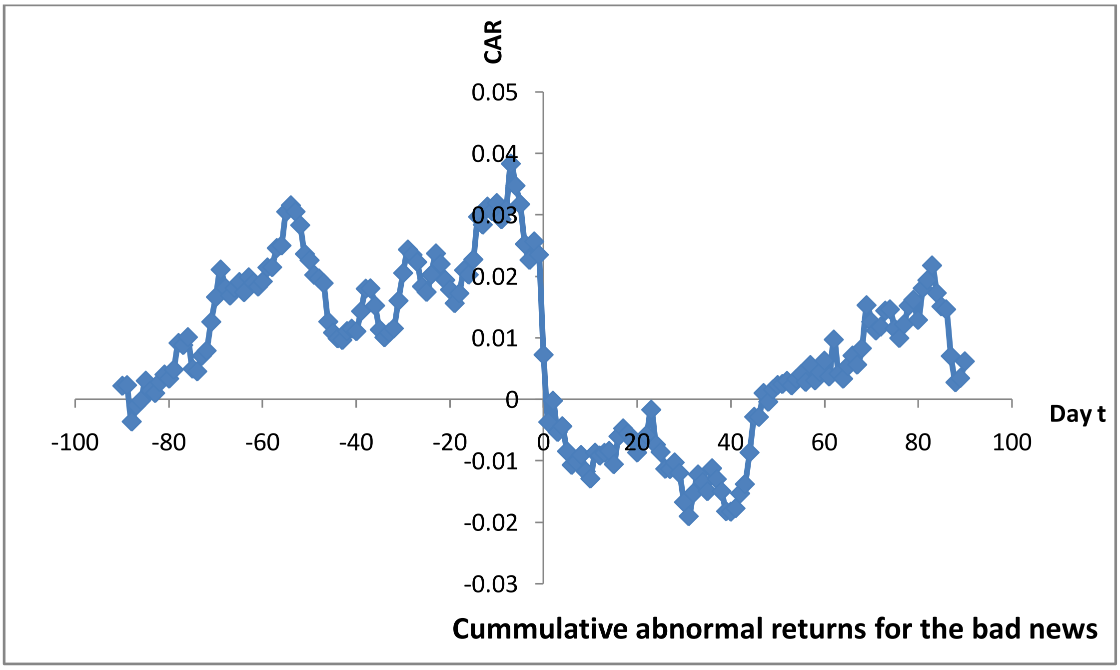


Table 4.1.2.8 indicates that stock returns of firms included in CAC40 are affected by the earnings announcements.

Before Event

For good news there are significant changes in the short term and long term period. T-statistics in the short term are 3.65 for the time frame [-5,-1], 1.96 for [-2,-1] and 1.86 for [-1,-1]. The t-statistics in the long term before the event are mostly significant. T-statistics for long term are 2.19 for the window frame [-70,-1], 1.90 for [-40,-1] and 2.16 for [-10,-1].

For the bad news t-values are totally insignificant in the short term and long term period, as we can see in table 4.1.2.7 Panel A and Panel B. T-statistics is -1.57 for the window frame [-5,-1], -0.31 for [-3,-1] and -0.68 for [-1,-1]. The t-statistics in the long term for bad news show no significant changes in the stock returns. T-statistics for long term are 0.68 for the window frame [-80,-1], -0.01 for [-50,-1] and -0.70 for [-10,-1].

After Event

For good news the t-statistics in the short term after the announcement are totally significant. T statstics in the short term are 4.70 for the time frame [1, 0], 4.14 for [3, 0] and is 3.50 for [4, 0]. The t-statistics after the announcement in the long term show significant changes upto thirty days after the event day and later no significant changes. T-statistics for long term showing significant changes are 3.00 for the time frame [10, 0], 3.32 for [20, 0] and 2.55 for [30, 0]. The t-statistics showing no significant change are 1.52 for the time frame [40, 0], 0.69 for [60, 0] and 1.12 for [80, 0].

For bad news t-values are strongly significant in the short term, as we can see in table 4.1.2.8 Panel A. T statistics in the short term are -6.03 for the time frame [1, 0], -4.30 for [2, 0] and -4.09 for [5, 0]. The t-statistics for bad news in the long term show significant changes upto forty days and then after that no significant changes till the study period. T statistics for the long term are -2.20 for the time frame [20, 0], -2.26 fot [30, 0], -2.04 for [40, 0], -0.69 for [60, 0] and -0.41 for [70, 0].

Overall, in the short term, the largest abnormal returns happen on day 1 for both news with t statistics is 4.70 for good news firms and is -6.03 for bad news firms. In the long term, there is evidence of pre-announcement abnormal return for the good news

Table 4.1.2.8- Aggregate Abnormal Returns around CAC40 index earnings announcements

The sample consists of 40 stocks listed on CAC40 index. Cumulative average abnormal returns CAAR are computed using the market model and the standard event study methodology. The estimation window for computing the market model parameters is the event time interval [-90, 90]. CAAR is tested for significance using t-statistics.

Panel A. Short-term Abnormal Returns

GOOD NEWS			BAD NEWS		
Event day	CAAR	t-statistic	Event day	CAAR	t-statistic
[-5, -1]	0.020	3.65***	[-5, -1]	-0.011	-1.57
[-4, -1]	0.018	3.74***	[-4, -1]	-0.008	-1.29
[-3, -1]	0.013	3.09***	[-3, -1]	-0.002	-0.31
[-2, -1]	0.007	1.96**	[-2, -1]	0.001	0.19
[-1, -1]	0.005	1.86*	[-1, -1]	-0.002	-0.68
[0, 0]	0.007	2.75***	[0, 0]	-0.016	-5.10***
[1, 0]	0.016	4.70***	[1, 0]	-0.027	-6.03***
[2, 0]	0.018	4.15***	[2, 0]	-0.024	-4.30***
[3, 0]	0.020	4.14***	[3, 0]	-0.029	-4.52***
[4, 0]	0.019	3.50***	[4, 0]	-0.028	-3.91***
[5, 0]	0.021	3.52***	[5, 0]	-0.032	-4.09***

Panel B. Long-term Abnormal Returns

GOOD NEWS			BAD NEWS		
Event day	CAAR	t-statistic	Event day	CAAR	t-statistic
[-90, -1]	0.055	2.39***	[-90, -1]	0.024	0.78
[-80, -1]	0.054	2.46***	[-80, -1]	0.019	0.68
[-70, -1]	0.045	2.19**	[-70, -1]	0.011	0.41
[-60, -1]	0.035	1.85*	[-60, -1]	0.005	0.21
[-50, -1]	0.032	1.86*	[-50, -1]	0.000	-0.01
[-40, -1]	0.029	1.90*	[-40, -1]	0.012	0.60
[-30, -1]	0.036	2.73***	[-30, -1]	0.007	0.43
[-20, -1]	0.020	1.80*	[-20, -1]	0.004	0.29
[-10, -1]	0.017	2.16***	[-10, -1]	-0.007	-0.70
[10, 0]	0.024	3.00***	[10, 0]	-0.036	-3.44***
[20, 0]	0.037	3.32***	[20, 0]	-0.032	-2.20**
[30, 0]	0.035	2.55***	[30, 0]	-0.040	-2.26**
[40, 0]	0.024	1.52	[40, 0]	-0.042	-2.04**
[50, 0]	0.016	0.89	[50, 0]	-0.021	-0.93
[60, 0]	0.013	0.69	[60, 0]	-0.017	-0.69
[70, 0]	0.009	0.43	[70, 0]	-0.011	-0.41
[80, 0]	0.025	1.12	[80, 0]	-0.011	-0.37
[90, 0]	0.033	1.43	[90, 0]	-0.017	-0.57

* Significant at 10% level
** Significant at 5% level
*** Significant at 1% level

and post earnings announcements abnormal return after 1-2 months for both types of news. This is a code law country, in which earnings announcements play less of a role as information is conveyed to the market since earlier. However when collecting data, I chose the earnings announcement day as the day that the news is first released instead of the day that formal presentations are made. As expected, results are the same as above indices in the US and the UK except the fact that stock react even before the first piece of news were available through public channel.

4.1.3. Summary

In summary, the results from this part of my analysis show that, in a code law country such as France, the pre-earnings announcement reaction is very clear. This happened as we expected it to, from when the earnings news is conveyed to the markets since before the earnings announcement date. In the common law countries such as US and UK, we do see some evidence of pre-earnings announcement reaction however this happens very close to the announcement date, as shown in figures from 4.1.1.1-4.1.1.8.

Beside that, in most cases the strongest reaction happened on the event day (0), the exceptions being some cases in the US with the strongest reaction happened on day (1). Note that in the US there are number of companies who released earnings news in the morning before market open and a number of companies who released earnings news in the afternoon after the market close. The noises in the results between day 0 and day 1 are due to this fact.

The strength level of reaction is still very strong in the short-term window periods, but reduced over time. In the long-term, we could see that good news reaction last longer and bad news end quicker for most indices except the NASDAQ 100. For example in the London Stock Exchange, good news reactions in cases of FTSE 100, FTSE 250, FTSE Small cap and FTSE AIM All Shares, are up to the whole studied period of 90 days post announcement; in the US, good news reactions for the DJIA are up to 50 days, for the S&P100 up to the whole studied period of 90 days; .As for bad news, in the London Stock Exchange, FTSE 100 reacts up to 10 days, FTSE 250, FTSE small cap react within 5 days after earnings announcement, FTSE AIM All Shares react after 20 days; in the US, the DJIA react within 5 days, S&P bad news react up to 10 days. The two cases that are different are NASDAQ 100 and CAC 40. NASDAQ100 has good news reaction lasting up to 20 days while bad news reaction lasting up to 80 days. In France, the CAC 40 good news reacted up to 30 days and bad news react within 40 days.

In addition, the increases/decreases in price are permanent. After the change has taken place, prices do not go back up or down from the original level as shown graphically and statistically.

Finally, there is more to discuss and with good prospects, a bright future for the good news, that allows the price to continue to drift up in the long time. Meanwhile on the psychological side, there is not much room for the investors to act with the bad news, hence their reactions end quickly, see Debont and Thatler (1990) among others. The case of the NASDAQ looks a bit different. The fact that NASDAQ contains 100 high tech firms could be an answer, more weight for the bad news than for the good news, thus it leads to longer reaction. The case of the CAC 40 in France did say the nature in its time to release the news; however, surprisingly, stocks still react strongly and most vigorously on the earnings announcement day than on any prior day.

The situation in the French relates to the fact that France is a code law accounting system, where earnings news are released to the markets through different channel before the official earnings announcement. The uncertainty therefore has been digested in a longer time and since pre-earnings announcemet period. As mentioned in chapter III in data selection process, the event day for French market is defined not by the date of the official earnings announcement but the day of the first unofficial release of even partial news regarding the earnings of a firm. The possibility of partitially implies that the different reaction of the French market to the arrival of earnings news compared to the US and the UK markets may be a statistical artefact caused by the definition of event date. In the other words it might be possible that if the French market received full information on the event day it might well react in the same way as the UK and the US market. This implies not only for the cumulative abnormal returns behaviour in this chapter but also in the other parts.

4.2. Trading Volume response to earnings announcements

4.2.1. Empirical specification

Following the methodologies used in Hedge and McDermott (2003) and Gregoriou et al (2006), we test the possibility of liquidity effects by analysing the impact of earnings announcements on the trading volume. The dummy variable panel fixed effects regression model which has following characteristics is employed to test for the presence of abnormal trading volume in the short term event window period.

$$LnVolume_{it} = \alpha_i + \gamma t + \sum_{-5}^{+5} D_j \beta_j + \varepsilon_i \qquad (4.2.1.1)$$

for i =1, n (n is number of firms included) and t = -90, 5 t is time trend corresponding to the period from ninety days pre event and 5 days after the event.

Where,

$LnVolume_{it}$ is the natural logarithm of trading volume for stock i at day t.

α_i captures the variation in trade volume across all the companies in our indices.

γt is the time trend that captures the changes in trading volume per day that common across all companies

D_j are dummy variables for each trading day in the event window [-5, +5].

The coefficients of the eleven dummy variables β_j capture the abnormal trading volume over the event window, [-5, +5].

ε_i is a random disturbance term with a mean of zero and a variance of σ^2,

α_i, γt, and β_j are parameters to be estimated.

I estimated the above model by fixed effects panel estimator using White heteroskedastic consistent covariance matrix. The logarithm of trading volume is taken in order to exclude skewness and kurtosis. The time trend is included in this model as literature documented that Volume have time trend in two papers from Hedge and Hedge and McDermott (2003) working on 74 additions and 27 deletions firms in New York Stock Exchange S&P 500, and Gregoriou (2008) working on 50 firms join the online trading system in London Stock Exchange FTSE AIM.

Results are presented in Panel A in 8 tables from table 4.2.2.1 to table 4.2.2.8. After control for linear time drifts by γt, we observe that there is a dramatic increase in trading volume around the earnings announcements for all indices. Looking at the coefficients for 11 dummies; we could see that the abnormal volume reaches its peak on the event day 0 or on day 1 across 8 indices. For a comparison, I add a dummy for day -10 in an alternative test with this model, the result has found that coefficient on the peak day is many times large as much as compared to the change on the day -10.

In addition intercept α_i is significant which also shows there is change in trading volume across firms. The regressions do not pass the normality test so that we cannot exclude the possibility of outliers caused in the data, however, when we use wild bootstrapping, the problem is solved (see Arghyrou and Gregoriou (2007) for more details)[29].

To analyse trading volume effects in the long term, I calculated the ratio between the pre and post event's daily trading volume per market value. I define the pre-earnings announcements period as the window [-90,-1], and the post earnings announcements period as the window [0, +90]. The standard t-statistic is used to compare sample means values. The results are also reported in Panel B in table 4.2.2.1 to table 4.2.2.8. The high t statistics suggest that in the long term trading volume still increases significantly for FTSE100, FTSE250, DJIA, NASDAQ100, S&P100 and CAC40. However, the trading volume increases but not significantly in the long term for FTSE Small Cap and FTSE AIM All Shares. One of the possible explanations for this is "herding". We would expect that stock traders herd more with larger stocks while less with small and new stocks. When there is news, traders react. In the long term, when the news ends, more traders tend to follow the large firms and less of them track the small firms.

4.2.2 Results and explanations

4.2.2.1 FTSE100. Trading Volume around earnings announcements.

In the short term, the positive and significant sign of eleven dummy variables confirms that trading volume increases significantly around earnings announcements. The above table show that on day -5, the coefficient of dummy is 0.078 with a t-statistic of 5.62. The abnormal volume continues to increase and reaches its peak on the day of earnings announcements, event day 0. On this day, β_0 is 0.968 and highly significant with a t-statistic of 63.93. The abnormal trading volume decreases from its peak but continues to be positive and significant throughout the post event window. α_j is significant showing that there are changes in trading volumes across the 40 firms in FTSE100. The regression equation does not pass the Normality test of residuals, which implies that the abnormal volume empirical estimates could be due to possible

[29] Arghyrou and Gregoriou (2007)

outliers in the data set. However, a wild bootstrapping test has corrected the critical values[30].

The coefficient of abnormal trading volume prior to earnings announcements on day -10 is -0.09. I obtained this number by running the same model with an additional

Table 4.2.2.1. FTSE100 Trading Volume response to earnings announcements

Panel A. Short-term Abnormal Trading Volume around earnings announcements

The following dummy variable panel fixed effects regression model is used to test for the presence of abnormal trading volume in the event period.

$$Volume_{ji} = \alpha_{ji} + \gamma t + \sum_{-5}^{+5} D_i \beta_i + \varepsilon_{it}$$

for j =1,99 and t = -90, 5

Where,

$Volume_{jt}$ is the natural logarithm of trading volume for stock j at day t.

α_j captures the variation in trade volume across all the companies in our sample.

D_i are dummy variables for each trading day in the event window [-5,+5].

The coefficients of the eleven dummy variables, β_i captures the abnormal trading volume over the event window, [-5,+5].

ε_j is a random disturbance term with a mean of zero and a variance of σ^2,

NORM(2) is the p value for the Jaque-Bera normality test of residuals.

Variable	Coefficient	t-Statistic
α	15.13	1000***
γ	0.00248	8.57***
β_5	0.078	5.62***
β_4	0.090	6.38***
β_3	0.032	2.17**
β_2	0.169	11.52***
β_1	0.237	15.79***
β0	0.968	63.93***
β1	0.521	33.82***
β2	0.288	18.08***
β3	0.343	21.39***
β4	0.310	18.83***
β5	0.320	19.50***
Adjusted R-squared	0.80	
NORM(2)	80.73***	

(Note: Test with D_10 give coefficient β_10= - 0.09)
* Significant at 10% level
** Significant at 5% level
*** Significant at 1% level

(Table 4.2.2.1continued on the following page)

[30] See Arghyrou and Gregoriou (2007) for more details about this.

(Table 4.2.2.1continued from preceding page)

Panel B. Long-term impact of earnings announcements on trading volume

The sample consists of 99 stocks on FTSE100 index. Standardised trading volume is computed as daily trading volume divided by the firm's market value. Standardised trading volumes are computed for pre-earnings announcement period [-90,-1] and the post-earnings announcement period [0,+90]. The t statistic is used to test the null hypothesis that the standardised trading volume is unchanged in the pre earnings announcement period as compared with the post earnings announcement period.

Variable	**Daily Trading Volume/Market Value**
Mean (Pre-earnings announcements)	7.13 per thousand
Mean (Post-earning announcements)	8.63 per thousand
Median (Pre-earnings announcements)	5.70 per thousand
Median (Post-earnings announcements)	6.91 per thousand
Mean (Post/Pre Ratio)	1.21
Median (Post/Pre Ratio)	1.21
T statistic	13.69***

* Significant at 10% level
** Significant at 5% level
*** Significant at 1% level

dummy on day -10, which takes value of 1 on day -10, and value of 0 on the otherdays. This indicates that abnormal trading volume on the peak day increases approximately 10.8 times greater than trading volume and abnormal trading volume decreases on day -10 before the earnings announcements, after we control the linear time drift in volume over time.

In the long term Post/Pre ratio of mean (median) of trading volume per market values for FTSE100 is1.21 (1.21), with a t statistic used to compare two means equal to 13.69. This significant value suggests that earnings announcements result in a rise in trading volume in the long term overall all.

4.2.2.2 FTSE250 Trading Volume response to earnings announcements.

The positive and significant sign of eleven dummy variables in the table 4.2.2.2 confirms that trading volume increases significantly around earnings announcements. The above table show that on day -5, the coefficient of dummy is 0.112 with a t-statistic of 7.61. The abnormal volume continues to increase and reaches its peak on the day of earnings announcements, event day 0. On this day, β_0 is 0.929 and highly significant with a t-statistic of 58.58. The abnormal trading volume decreases from its peak but continues to be positive and significant throughout the post event window. α_j

is significant showing that there are changes in trading volumes across the 233 firms in FTSE250. The regression equation does not pass the Normality test of residuals, which implies that the abnormal volume empirical estimates could be due to the possible outliers in the data set. However, wild bootstrapping test has corrected the critical values[31].

Table 4.2.2.2 FTSE250 Trading Volume response to earnings announcements

Panel A. Short-term Abnormal Trading Volume around earnings announcements

The following dummy variable panel fixed effects regression model is used to test for the presence of abnormal trading volume in the event period.

$$Volume_{ji} = \alpha_{ji} + \gamma t + \sum_{-5}^{+5} D_i \beta_i + \varepsilon_{it}$$

for j =1,233 and t = -90, 5

Where,

$Volume_{jt}$ is the natural logarithm of trading volume for stock j at day t.

α_j captures the variation in trade volume across all the companies in our sample.

D_i are dummy variables for each trading day in the event window [-5,+5].

The coefficient of the eleven dummy variables, βi captures the abnormal trading volume over the event window, [-5,+5].

ε_j is a random disturbance term with a mean of zero and a variance of σ^2,

NORM(2) is the p value for the Jaque-Bera normality test of residuals.

Variable	Coefficient	t-Statistic
α	12.35	892***
γ	0.00148	5.28***
β_5	0.112	7.61***
β_4	0.096	6.49***
β_3	0.094	6.12***
β_2	0.172	11.17***
β_1	0.259	16.41***
β0	0.929	58.58***
β1	0.561	34.84***
β2	0.446	27.23***
β3	0.444	26.53***
β4	0.425	25.18***
β5	0.370	21.66***
Adjusted R-squared	0.682	
NORM(2)	10473***	

(Note: Test with D_10 give coefficient β_10 = - 0.05)
* Significant at 10% level
** Significant at 5% level
*** Significant at 1% level

(Table 4.2.2.2 continued on following page)

[31] See Arghyrou and Gregoriou (2007) for more details about this.

(Table 4.2.2.2 continued from preceding page)

Panel B. Long-term impact of earnings announcements on trading volume

The sample consists of 233 stocks on FTSE250 index with data available. Standardised trading volume is computed as daily trading volume divided by the firm's market value. Standardised trading volumes are computed for pre-earnings announcement period [-90,-1] and the post-earnings announcement period [0,+90]. The t statistic is used to test the null hypothesis that the standardised trading volume is unchanged in the pre earnings announcement period as compared with the post earnings announcement period.

Variable	Daily Trading Volume/Market Value
Mean (Pre-earnings announcements)	5.43 per thousand
Mean (Post-earning announcements)	6.07 per thousand
Median (Pre-earnings announcements)	3.44 per thousand
Median (Post-earnings announcements)	4.08 per thousand
Mean (Post/Pre Ratio)	1.12
Median (Post/Pre Ratio)	1.18
T statistic	7.45***

* Significant at 10% level
** Significant at 5% level
*** Significant at 1% level

By running the same model with an additional dummy on day -10, which takes value of 1 on day -10, and value of 0 on the other days, we got the coefficient β_{-10} which is -0.05. This indicates that abnormal trading volume on the peak day increases approximately 18.4 times compared to trading volume's change ten day before the earnings announcements, after we control the linear time drift in volume over time.

In the long term Post/Pre ratio of mean (median) of trading volume per market values for FTSE250 is1.12 (1.18), with a t statistic used to compare two means equal to 7.45. This significant value suggests that earnings announcements result in a rise in trading volume in the long term overall all.

4.2.2.3 FTSE SMALLCAP. Trading Volume around earnings announcements

Similar results apply to the FTSE Small Cap. The positive and significant sign of ten dummy variables (except β_{-3}) confirms that trading volume increases significantly around earnings announcements. The above table show that on day -5, the coefficient of dummy is 0.052 with a t-statistic of 2.87. The abnormal volume continues to increase and reaches its peak on the day of earnings announcements, event day 0. On this day, β_0 is 0.968 and highly significant with a t-statistic of 50.43. The abnormal trading volume decreases from its peak but continues to be positive and significant throughout the post event window. α_j is significant showing that there are changes in trading volumes across the 310 firms in FTSE Small Cap. The regression equation does not pass the Normality test of residuals; this implies that the abnormal volume empirical estimates could be due to possible outliers in the data set. Again, wild bootstrapping test helps to correct the critical values, and result does not change[32].

Table 4.2.2.3. FTSE Small Cap Trading Volume response to earnings announcements

Panel A. Short-term Abnormal Trading Volume around earnings announcements

The following dummy variable panel fixed effects regression model is used to test for the presence of abnormal trading volume in the event period.

$$Volume_{ji} = \alpha_{ji} + \gamma t + \sum_{-5}^{+5} D_i \beta_i + \varepsilon_{it}$$

for j =1,310 and t = -90, 5

Where,

$Volume_{jt}$ is the natural logarithm of trading volume for stock j at day t.

α_j captures the variation in trade volume across all the companies in our sample.

D_i are dummy variables for each trading day in the event window [-5,+5].

The coefficient of the eleven dummy variables, βi captures the abnormal trading volume over the event window, [-5,+5].

ε_j is a random disturbance term with a mean of zero and a variance of σ^2,

NORM(2) is the p value for the Jaque-Bera normality test of residuals.

Variable	Coefficient	t-Statistic
α	9.53	590.95***
γ	5.62E-05	0.170
β_5	0.052	2.87***
β_4	0.152	8.29***
β_3	-0.108	-5.92***
β_2	0.075	3.99***
β_1	0.137	7.29***
β0	0.968	50.43***
β1	0.602	30.63***
β2	0.519	26.15***
β3	0.344	17.10***
β4	0.451	22.22***
β5	0.318	15.56***
Adjusted R-squared	0.412	
NORM(2)	1725***	

(Note: Test with D_10 give coefficient β_10 = - 0.08)
* Significant at 10% level
** Significant at 5% level
*** Significant at 1% level

(Table 4.2.2.3 continued on the following page)

[32] See Arghyrou and Gregoriou (2007) for more details about this.

Table 4.2.2.3 continued from preceding page)

Panel B. Long-term impact of earnings announcements on trading volume

The sample consists of 310 stocks on FTSE Small Cap index with data available. Standardised trading volume is computed as daily trading volume divided by the total market value of the firm. Standardised trading volumes are computed for pre-earnings announcement period [-90,-1] and the post-earnings announcement period [0,+90]. The t statistic is used to test the null hypothesis which states that the standardised trading volume is unchanged in the pre earnings announcement period as compared with the post earnings announcement period.

Variable	**Daily Trading Volume/Market Value**
Mean (Pre-earnings announcements)	2.72 per thousand
Mean (Post-earning announcements)	2.78 per thousand
Median (Pre-earnings announcements)	0.86 per thousand
Median (Post-earnings announcements)	0.92 per thousand
Mean (Post/Pre Ratio)	1.02
Median (Post/Pre Ratio)	1.07
T statistic	0.91 (p=0.36)

* Significant at 10% level
** Significant at 5% level
*** Significant at 1% level

The trading volume prior to earnings announcements on day -10 is -0.08. We got this number by adding an additional dummy on day -10, which takes value of 1 on day -10, and value of 0 on other days. This indicates that abnormal trading volume increases approximately 12 times greater than trading volume decreases ten days before the earnings announcements, after we control the linear time drift in volume over time.

In the long term Post/Pre ratio of mean (median) of trading volume per market values for the FTSE Small Cap is1.02 (1.07), with a t statistic used to compare two means equal to 0.91. This insignificant value suggests that earnings announcements does not result in a rise in trading volume in the long term overall all for the FTSE Small Cap.

4.2.2.4 FTSEAIM ALLSHARES. Trading Volume around earnings announcements

The positive and significant sign of eight dummy variables (except β_{-5}, β_{-4}, β_{-3}) confirms that trading volume increases significantly around earnings announcements. The above table shows that on day -2, the coefficient of dummy is 0.07 with a t-statistic of 4.73. The abnormal volume continues to increase and reaches its peak on the day of earnings announcements, event day 0. On this day, β_0 is 1.299 and highly significant with a t-statistic of 79.02. The abnormal trading volume decreases from its peak but continues to be positive and significant throughout the post event window. α_j is significant showing that there are changes in trading volumes across the 912 firms in FTSEAIM ALLSHARES (one firm is dropped because there is not enough number of observations). The regression equation does not pass the Normality test of residuals, which implies that the abnormal volume empirical estimates could be due to

Table 4.2.2.4. FTSE AIM All Shares Trading Volume response to earnings announcements

Panel A. Short-term Abnormal Trading Volume around earnings announcements

The following dummy variable panel fixed effects regression model is used to test for the presence of abnormal trading volume in the event period.

$$Volume_{ji} = \alpha_{ji} + \gamma t + \sum_{-5}^{+5} D_i \beta_i + \varepsilon_{it}$$

for j =1,913 and t = -90, 5

Where,

$Volume_{jt}$ is the natural logarithm of trading volume for stock j at day t.

α_j captures the variation in trade volume across all the companies in our sample.

D_i are dummy variables for each trading day in the event window [-5,+5].

The coefficient of the eleven dummy variables, βi captures the abnormal trading volume over the event window, [-5,+5].

ε_j is a random disturbance term with a mean of zero and a variance of σ^2,

NORM(2) is the p value for the Jaque-Bera normality test of residuals.

Variable	Coefficient	t-Statistic
α	7.34	464***
γ	-0.000164	-0.54
β_5	-0.014	-0.95
β_4	-0.079	-5.70***
β_3	-0.031	-2.07**
β_2	0.070	4.73***
β_1	0.254	15.43***
β0	1.299	79.02***
β1	0.866	52.18***
β2	0.556	33.59***
β3	0.411	23.62***
β4	0.343	19.76***
β5	0.287	15.77***
Adjusted R-squared	0.549	
NORM(2)	2063***	

(Note: Test with D_10 give coefficient β_10 = - 0.08)

* Significant at 10% level
** Significant at 5% level
*** Significant at 1% level

(Table 4.2.2.4 continued on following page)

(Table 4.2.2.4 continued from preceding page)

Panel B. Long-term impact of earnings announcements on trading volume

The sample consists of 913 stocks on FTSE AIM All Shares index with data available. Standardised trading volume is computed as daily trading volume divided by the market value of the firm. Standardised trading volumes are computed for pre-earnings announcement period [-90,-1] and the post-earnings announcement period [0,+90]. The t statistic is used to test the null hypothesis which sates that the standardised trading volume is unchanged in the pre earnings announcement period as compared with the post earnings announcement period.

Variable	**Daily Trading Volume/Market value**
Mean (Pre-earnings announcements)	2.96 per thousand
Mean (Post-earning announcements)	2.98 per thousand
Median (Pre-earnings announcements)	0.71 per thousand
Median (Post-earnings announcements)	0.70 per thousand
Mean (Post/Pre Ratio)	1.01
Median (Post/Pre Ratio)	0.99
T statistic	0.36 (p=0.71)

* Significant at 10% level
** Significant at 5% level
*** Significant at 1% level

possible outliers in the data set. Again, this thesis uses wild bootstrapping test to correct the critical values, and the result does not change.[33]

The coefficient of change in trading volume prior to earnings announcements on day -10 is -0.08 after adding an addition dummy on day -10, which takes value of 1 on day -10, and value of 0 on the other days. This indicates that abnormal trading volume increases approximately 16.23 times greater than trading volume decreases ten days before the earnings announcements, after we control the linear time drift in volume over time.

In the long term Post/Pre ratio of mean (median) of trading volume per market values for FTSE AIM All Shares is1.01 (0.99), with a t statistic used to compare two means equal to 0.99. This insignificant value suggests that earnings announcements does not result in a rise in trading volume in the long term overall all for the FTSE AIM All Shares.

[33] See Arghyrou and Gregoriou (2007) for more details about this.

4.2.2.5 DJIA. Trading Volume around earnings announcements

The positive and significant sign of eleven dummy variables confirm that trading volume increases significantly around earnings announcements. The above table shows that on day -5, the coefficient of dummy is 0.102 with a t-statistic of 5.87. The abnormal volume continues to increase and reaches its peak on the day of earnings announcements, event day 0. On this day, β_0 is 0.735 and highly significant with a t-

Table 4.2.2.5. DJIA Trading Volume response to earnings announcements

Panel A. Short-term Abnormal Trading Volume around earnings announcements

The following dummy variable panel fixed effects regression model is used to test for the presence of abnormal trading volume in the event period.

$$Volume_{ji} = \alpha_{ji} + \gamma t + \sum_{-5}^{+5} D_i \beta_i + \varepsilon_{it}$$

for j =1,30 and t = -90, 5

Where,

$Volume_{jt}$ is the natural logarithm of trading volume for stock j at day t.

α_j captures the variation in trade volume across all the companies in our sample.

D_i are dummy variables for each trading day in the event window [-5,+5].

The coefficient of the eleven dummy variables, βi captures the abnormal trading volume over the event window, [-5,+5].

ε_j is a random disturbance term with a mean of zero and a variance of σ^2,

NORM(2) is the p value for the Jaque-Bera normality test of residuals.

Variable	Coefficient	t-Statistic
α	13.107	702***
γ	-0.00145	-3.98***
β_5	0.102	5.87***
β_4	0.063	3.50***
β_3	0.075	4.10***
β_2	0.156	8.36***
β_1	0.244	12.73***
β0	0.735	38.07***
β1	0.622	31.70***
β2	0.287	14.39***
β3	0.240	11.70***
β4	0.190	9.21***
β5	0.179	8.48***
Adjusted R-squared	0.724	
NORM(2)	1302***	

(Note: Test with D_10 gives coefficient β_10 =   0.001)

* Significant at 10% level
** Significant at 5% level
*** Significant at 1% level

(Table 4.2.2.5 continued on following page)

(Table 4.2.2.5 continued from preceding page)

Panel B. Long-term impact of earnings announcements on trading volume

The sample consists of 30 stocks on DJIA index. Standardised trading volume is computed as daily trading volume divided by the firm's market value. Standardised trading volumes are computed for pre-earnings announcement period [-90,-1] and the post-earnings announcement period [0,+90]. The t statistic is used to test the null hypothesis which states that the standardised trading volume is unchanged in the pre earnings announcement period as compared with the post earnings announcement period.

Variable	**Daily Trading Volume/Market value**
Mean (Pre-earnings announcements)	5.62 per thousand
Mean (Post-earning announcements)	6.06 per thousand
Median (Pre-earnings announcements)	4.16 per thousand
Median (Post-earnings announcements)	4.66 per thousand
Mean (Post/Pre Ratio)	1.08
Median (Post/Pre Ratio)	1.12
T statistic	2.84***

* Significant at 10% level
** Significant at 5% level
*** Significant at 1% level

statistic of 38. The abnormal trading volume decreases from its peak but continues to be positive and significant throughout the post event window. α_j is significant showing that there are changes in trading volumes across the 30 firms in DJIA. The regression equation does not pass the Normality test of residuals, which implies that the abnormal volume empirical estimates could be due to possible outliers in the data set. I use wild bootstrapping test to correct the critical values, and result does not change[34].

By adding an addition dummy variable on day -10, we got the trading volume prior to earnings announcements on day -10 which is 0.001. This indicates that abnormal trading volume increases approximately 700 times greater than trading volume's change ten days before the earnings announcements, after we control the linear time drift in volume over time.

In the long term Post/Pre ratio of mean (median) of trading volume per market values for DJIA is1.08 (1.12), with a t statistic used to compare two means equal to 2.84. This significant value suggests that earnings announcements result in a rise in trading volume in the long term overall all for DJIA.

[34] See Arghyrou and Gregoriou (2007) for more details about this.

4.2.2.6 NASDAQ100. Trading Volume around earnings announcements

The positive and significant sign of dummy variables (includes $\beta_{\_2}$, $\beta_{\_1}$, β_0, β_1, β_2, β_3, β_4, β_5) confirms that trading volume increases significantly around earnings announcements. The above table shows that on day -2, the coefficient of dummy is 0.013 with a t-statistic of 3.01. The abnormal volume continues to increase and reaches its peak right after the day of earnings announcements, day 1. On this day, β_1

Table 4.2.2.6. NASDAQ100 Trading Volume response to earnings announcements

Panel A. Short-term Abnormal Trading Volume around earnings announcements

The following dummy variable panel fixed effects regression model is used to test for the presence of abnormal trading volume in the event period.

$$Volume_{ji} = \alpha_{ji} + \gamma t + \sum_{-5}^{+5} D_i \beta_i + \varepsilon_{it}$$

for j =1,96 and t = -90, 5

Where,

$Volume_{jt}$ is the natural logarithm of trading volume for stock j at day t.

α_j captures the variation in trade volume across all the companies in our sample.

D_i are dummy variables for each trading day in the event window [-5,+5].

The coefficient of the eleven dummy variables, βi captures the abnormal trading volume over the event window, [-5,+5].

ε_j is a random disturbance term with a mean of zero and a variance of σ^2,

NORM(2) is the p value for the Jaque-Bera normality test of residuals.

Variable	Coefficient	t-Statistic
α	11.731	649***
γ	-0.00016	-0.49
β_5	0.013	0.98
β_4	0.008	0.62
β_3	0.020	1.40
β_2	0.043	3.01***
β_1	0.188	13.02***
β0	0.733	49.78***
β1	0.917	61.11***
β2	0.385	24.67***
β3	0.207	13.10***
β4	0.177	10.89***
β5	0.145	8.89***
Adjusted R-squared	0.853	
NORM(2)	2220***	

(Note: Test with D_10 gives coefficient β_10 = 0.04)

* Significant at 10% level
** Significant at 5% level
*** Significant at 1% level

(Table 4.2.2.6 continued on following page)

(Table 4.2.2.6 continued from preceding page)

Panel B. Long-term impact of earnings announcements on trading volume

The sample consists of 96 stocks on NASDAQ100 index with data available. Standardised trading volume is computed as daily trading volume divided by the company's market value. Standardised trading volumes are computed for pre-earnings announcement period [-90,-1] and the post-earnings announcement period [0,+90]. The t statistic is used to test the null hypothesis that the standardised trading volume is unchanged in the pre earnings announcement period as compared with the post earnings announcement period.

Variable	**Daily Trading Volume/Market Value**
Mean (Pre-earnings announcements)	14.69 per thousand
Mean (Post-earning announcements)	15.09 per thousand
Median (Pre-earnings announcements)	10.50 per thousand
Median (Post-earnings announcements)	11.29 per thousand
Mean (Post/Pre Ratio)	1.03
Median (Post/Pre Ratio)	1.08
T statistic	1.81*

* Significant at 10% level
** Significant at 5% level
*** Significant at 1% level

is 0.733 and highly significant with a t-statistic of 61.11. The abnormal trading volume decreases from its peak but continues to be positive and significant throughout the post event window. α_j is significant showing that there are changes in trading volumes across the 96 firms in NASDAQ100. The regression equation does not pass the Normality test of residuals, implies that the abnormal volume empirical estimates could due be to possible outliers in the data set. Wild bootstrapping test correct the critical values, and result does not change[35].

Running the same model with an additional dummy on the day -10, I got the trading volume prior to earnings announcements on day -10 which is 0.04. This indicates that abnormal trading volume increased approximately 18.32 times greater than change in trading volume ten days before the earnings announcements, after controlling the linear time drift in volume over time.

In the long term Post/Pre ratio of mean (median) of trading volume per market values for NASDAQ100 is1.03 (1.08), with a t statistic used to compare two means equal to

[35] See Arghyrou and Gregoriou (2007) for more details about this.

1.81. This significant value at 0.1% suggests that earnings announcements result in a rise in trading volume in the long term overall all for NASDAQ100.

4.2.2.7 S&P100. Trading Volume around earnings announcements

The positive and significant sign of eleven dummy variables confirms that trading volume increases significantly around earnings announcements. The above table

Table 4.2.2.7. S&P100 Trading Volume response to earnings announcements

Panel A. Short-term Abnormal Trading Volume around earnings announcements

The following dummy variable panel fixed effects regression model is used to test for the presence of abnormal trading volume in the event period.

$$Volume_{ji} = \alpha_{ji} + \gamma t + \sum_{-5}^{+5} D_i \beta_i + \varepsilon_{it}$$

for j =1,100 and t = -90, 5

Where,

$Volume_{jt}$ is the natural logarithm of trading volume for stock j at day t.

α_j captures the variation in trade volume across all the companies in our sample.

D_i are dummy variables for each trading day in the event window [-5,+5].

The coefficient of the eleven dummy variables, βi captures the abnormal trading volume over the event window, [-5,+5].

ε_j is a random disturbance term with a mean of zero and a variance of σ^2,

NORM(2) is the p value for the Jaque-Bera normality test of residuals.

Variable	Coefficient	t-Statistic
α	12.442	770***
γ	-0.00018	-0.58
β_5	0.068	4.54***
β_4	0.064	4.17***
β_3	0.052	3.36***
β_2	0.093	5.87***
β_1	0.219	13.35***
β0	0.682	41.67***
β1	0.581	34.93***
β2	0.305	18.00***
β3	0.275	15.91***
β4	0.240	13.76***
β5	0.214	12.06***
Adjusted R-squared	0.838	
NORM(2)	3215***	

(Note: Test with D_10 gives coefficient β = 0.04)

* significant at 10% level
** Significant at 5% level
*** Significant at 1% level

(Table 4.2.2.7 continued on following page)

(Table 4.2.2.7 continued from preceding page)

Panel B. Long-term impact of earnings announcements on trading volume

The sample consists of 100 stocks on S&P100 index with data available. Standardised trading volume is computed as daily trading volume divided by the company's market value. Standardised trading volumes are computed for pre-earnings announcement period [-90,-1] and the post-earnings announcement period [0,+90]. The t statistic is used to test the null hypothesis which sates that the standardised trading volume is unchanged in the pre earnings announcement period as compared with the post earnings announcement period.

Variable	**Standardised Trading Volume**
Mean (Pre-earnings announcements)	7.20 per thousand
Mean (Post-earning announcements)	8.19 per thousand
Median (Pre-earnings announcements)	4.93 per thousand
Median (Post-earnings announcements)	5.79 per thousand
Mean (Post/Pre Ratio)	1.14
Median (Post/Pre Ratio)	1.18
T statistic	8.36***

* Significant at 10% level
** Significant at 5% level
*** Significant at 1% level

shows that on day -5, the coefficient of dummy is 0.068 with a t-statistic of 4.54. The abnormal volume continues to increase and reaches its peak right on the day of earnings announcements itself, day 0. On this day, β_0 is 0.682 and highly significant with a t-statistic of 41.67. The abnormal trading volume decreases from its peak but continues to be positive and significant throughout the post event window. α_j is significant showing that there are changes in trading volumes across the 100 firms in S&P100. The regression equation does not pass the Normality test of residuals, which implies that the abnormal volume empirical estimates could be due to possible outliers in the data set. This thesis use, wild bootstrapping tests to correct the critical values, and result does not change[36].

The trading volume prior to earnings announcements on day -10 is 0.04 after adding an additional dummy variable on day -10. This indicates that abnormal trading volume increases approximately 17.05 times greater than the change in trading volume increases ten days before the earnings announcements, after we control the linear time drift in volume over time.

[36] See Arghyrou and Gregoriou (2007) for more details about this.

In the long term Post/Pre ratio of mean (median) of trading volume per market values for S&P100 is1.14 (1.18), with a t statistic used to compare two means equal 8.36. This significant value suggests that earnings announcements result in a rise in trading volume in the long term overall all for S&P100.

4.2.2.8 CAC40. Trading Volume around earnings announcements

Table 4.2.2.8. CAC40 Trading Volume response to earnings announcements

Panel A. Short-term Abnormal Trading Volume around earnings announcements

The following dummy variable panel fixed effects regression model is used to test for the presence of abnormal trading volume in the event period.

$$Volume_{ji} = \alpha_{ji} + \gamma t + \sum_{-5}^{+5} D_i \beta_i + \varepsilon_{it}$$

for j =1,40 and t = -90, 5

Where,

$Volume_{jt}$ is the natural logarithm of trading volume for stock j at day t.

α_j captures the variation in trade volume across all the companies in our sample.

D_i are dummy variables for each trading day in the event window [-5,+5].

The coefficient of the eleven dummy variables, βi captures the abnormal trading volume over the event window, [-5,+5].

ε_j is a random disturbance term with a mean of zero and a variance of σ^2,

NORM(2) is the p value for the Jaque-Bera normality test of residuals.

Variable	Coefficient	t-Statistic
α	11.33	803***
γ	0.0019	6.68***
β_5	0.162	11.27***
β_4	0.180	12.27***
β_3	0.174	11.71***
β_2	0.116	7.68***
β_1	0.302	19.59***
β0	0.735	46.94***
β1	0.531	33.32***
β2	0.258	15.91***
β3	0.239	14.56***
β4	0.312	18.68***
β5	0.291	17.14***
Adjusted R-squared	0.717	
NORM(2)	445***	

(Note: Test with D_10 gives coefficient β_10 = 0.01)

* Significant at 10% level
** Significant at 5% level
*** Significant at 1% level

(Table 4.2.2.8 continued on following page)

(Table 4.2.2.8 continued from preceding page)

Panel B. Long-term impact of earnings announcements on trading volume

The sample consists of 40 stocks on CAC40 index. Standardised trading volume is computed as daily trading volume divided by the market value of the company. Standardised trading volumes are computed for pre-earnings announcement period [-90,-1] and the post-earnings announcement period [0,+90]. The t statistic is used to test the null hypothesis which states that the standardised trading volume is unchanged in the pre earnings announcement period as compared with the post earnings announcement period.

Variable	**Daily Trading Volume/Market Value**
Mean (Pre-earnings announcements)	4.75 per thousand
Mean (Post-earning announcements)	5.45 per thousand
Median (Pre-earnings announcements)	3.95 per thousand
Median (Post-earnings announcements)	4.67 per thousand
Mean (Post/Pre Ratio)	1.15
Median (Post/Pre Ratio)	1.18
T statistic	7.17***

* Significant at 10% level
** Significant at 5% level
*** Significant at 1% level

The positive and significant sign of eleven dummy variables confirms that trading volume increases significantly around earnings announcements. The above table show that on day -5, the coefficient of dummy is 0.162 with a t-statistic of 11.27. The abnormal volume continues to increase and reaches its peak on the day of earnings announcements, event day 0. On this day, β_0 is 0.735 and highly significant with a t-statistic of 46.94. The abnormal trading volume decreases from its peak but continues to be positive and significant throughout the post event window. The regression equation also does not pass the Normality test of residuals, which implies that the abnormal volume empirical estimates are due to possible outliers in the data set. Again, wild bootstrapping test helps to correct the critical values, and result does not change[37]. Finally, α_j is significant showing that there are changes in trading volumes across the 40 firms in the CAC40.

The trading volume prior to earnings announcements on day -10 is 0.01 after adding an additional dummy on day -10. This dummy take value of 1 on day -10, and value of 0 other days. The coefficient for dummy on day -10 indicates that abnormal trading

[37] See Arghyrou and Gregoriou (2007) for more details about this.

volume increase approximately 73 times greater than trading volume increased ten days before the earnings announcements, after we control the linear time drift in volume over time.

In the long term Post/Pre ratio of mean (median) of trading volume per market values for the CAC40 is1.15 (1.18), with a t statistic used to compare two means equal 7.17. This significant value suggests that earnings announcements result in a rise in trading volume in the long term overall all for the CAC40.

4.2.3 Summary.

In summary, this part of analysis shows that, in the short term within five days before the earnings announcement and five days after earnings announcement, there is dramatic increase in trading volume for all indices. The impacts of the earnings news on trading volume are most profound when the news is released. The abnormal volume reaches its peak on the event day 0 in the London Stock Exchange and for the DJIA, the S&P100 in the US stock Exchange and the CAC40 in Euronext Paris, on day 1 for the NASDAQ100. The trading volumes are many times as high as compared to the change on day -10 in the additional test. See tables from 4.2.2.1 to 4.2.2.8, panel A for details. After the announcement date, the news continues to have effects on trading volume. Trading volume still increases, however the impact level is less strong and gradually decreases day by day. Results also show that, trading volume not only increases due to earnings announcement but also increases by time. Besides the impact of earnings news, this time factor (linear time trend) will also affect stock liquidity, the reason being the speed of selling stocks is also related to volume. Generally when the volume increases, the cost of trading will reduce, hence it alone makes total bid ask spread decrease or in other word, stock liquidity improves.

In the long term, when compared the whole post earnings announcement and pre earnings announcement periods[38], this thesis reports there is increase in trading volume scaled by market value for all of eight indices. See tables from 4.2.2.1 to 4.2.2.8, panel B. Using standard t test used to compare two sample mean values, the results suggest that in the long term, trading volume still increases significantly for large and medium stocks (including FTSE100, FTSE250, DJIA, NASDAQ100, S&P100, and CAC40), but not significantly for small stocks (FTSE Small Cap and

[38] Pre-earnings announcement period is defined as period from day -90 to day -1. Post earnings announcements period is defined as period from day 0 to day +90.

FTSE AIM All Shares). The possible explanation is that when the news is released, people trade more, however when the news ceases, traders are more likely to follow large stocks, less likely to follow smaller firms. This herding behaviour or 'following the trend' has frequently been observed in reality and documented while agents trade the securities whose value is uncertain and whose price is efficiently set by a market maker. Most agents follow their private information and prices converge to the fundamental value[39].

4.3. Spread effect of earnings announcement

4.3.1. Empirical specification

Conceptualised by Van Horne 1970 and then followed by a number of authors such as Beinesh and Gardner 1995, Hedge and McDermott 2003, and Gregoriou and Ioannidis (2006) the intuition of Information Cost Liquidity Hypothesis is good information creates significant improvement in stock performance. Given that there is a richer information environment, this part of the thesis examines whether there is increase/decrease in market liquidity in the same manner as stated.

To analyse the impact of earnings announcement on the short term liquidity of indices, I constructed ratios of the three daily average bid-ask spreads over the various interaval event windows pre and post earnings announcements. Quoted bid-ask spreads is defined as the ask price minus the bid price. Relative bid-ask spreads is measured as the ask price minus the bid price divided by the quoted mid price. Effective bid-ask spreads is measured as twice the absolute value of the difference between the transaction price and the mid price in effect at the time of the trade. I compute all three ratios for quote bid-ask spreads, relative bid-ask spreads and effective bid-ask spreads because each ratio has its own shortcomings. As discussed above, relative bid-ask spreads is not an accurate method to measure the stock liquidity as trades often occurs between the quoted ask price and the bid price. Another shortcoming was pointed out by Lee and Ready (1991) is that relative spread over states the trading cost of a stock for its failures to take in to account the price increase tendency after a purchase, and a decrease tendency after a sale. The effective spread therefore computed to reduce the shortcoming of the other two measures. However, there is still another problem with using relative and effective bid-ask

[39] See BRUNNERMEIER, M.K., 2001; DEVENOW, A. and I. WELCH, 1996; TRUEMAN, B., 1994

spreads only. These two measures will face the problem of price increasing around earnings announcements as shown in the table 4.3.2.1-4.3.2.3, it does increase mid price as well. Thus for a full picture we compute all three measures of bid-ask spreads.

All spread ratios are computed as the ratio of the average bid-ask spreads of each individual stock over the indicated event time period to the average bid-ask spreads measure over the 90 day pre earnings announcement. The null hypothesis that the mean of the reported ratio is equal to 1 is tested using a standard t statistic. Results are reported in table 4.3.2.1 to 4.3.2.3. Effective spread is the best indicator in some cases when three ratios show different results for the shortcoming of the other two measures mentioned above.

Generally, the results show that, spread ratios increase significantly around the earnings events then gradually decrease for the FTSE100, FTSE Small Cap, FTSE AIM All Shares in London Stock Exchange and DJIA, NASDAQ100 and S&P100 in the American Stock Exchanges (except two cases: the FTSE250 and the CAC 40). This implies that for these indices, stock market liquidity decreases in the short term, and then gradually increases when the news ceases. Earnings announcement provides more uncertainty to the market. The informed traders trade when there is the earnings news; this causes the market makers to increase spreads. In the long term, there are no more uninformed traders; that results in the spread going down. However, notice that even if the spread goes down in many cases at the end of this period, it is still greater than the average of the 90 days prior the event.

The results also imply that stock liquidity increases but insignificantly for the FTSE250 in terms of effective spread. A possible explanation for it is that the FTSE 250 joined the electronic trading system recently at the end of 2003/2004; this increased the stocks liquidity so that the impact on earnings announcement might not be clear for this ratio. FTSE100 and the rest of indicies are different in the sense that FTSE100 joined electronic trading system in 1997 and reverted back to equilibrium. The other indices in my data set had not joined the system yet.

The special case is CAC40, spread decreases both in the short term and long term compared to the average of 90 days before the event in Euronext Paris for CAC40. This implies that market liquidity increased after earnings announcements both in the short and long term. However, longer the event window period, lower the ratio is. This implies that even though market liquidity increased due to the impacts of announcement in the short term, liquidity continues to increase by time in the long term.

As discussed earlier, the CAC40 is a code law accounting system where earnings news is conveyed to the markets well in advance of the announcement date. This could be a reason why there is less uncertainty about the news and we expect a smaller reaction immediately to earnings announcements and less important role of earnings news/or there might be another factor that clear out the impact of new news.

From 4.2, I recall that trading volume increased around earnings announcements for all indices. As a consequence, cost of trading decreased when trading volume increased as market makers pay cheaper prices. Change in stock liquidity (bid ask spread) will reflect this by two effects: the decrease in cost of trading (order processing and inventory holding components) caused by the increase in trading volume, and the increase in the uncertainty about the news, or in other words, the gap between informed and uninformed traders. Since the total effect in the US and the UK market is an increase in bid ask spread and in Euronext Paris is a decrease in the bid ask spread, the results from this part 4.3 implies that the information asymmetry cost component dominates the bid-ask spread in the US and the UK markets. This entirely agrees with Gregoriou (2009) study on the FTSE100. Conversely, cost of trading dominates bid-ask spreads in Frances CAC40 index.

In short, for the CAC 40 under code law accounting system, liquidity increases due to an immediate impact of earnings announcements, and for the other common law stocks, liquidity decreases due to this immediate impact. In both the types of system, liquidity increases by time after the earnings announcements. Chapter V will provide more evidence on this issue.

4.3.2 Results and explanations

4.3.2.1 London Stock Exchange

The results of the changes in liquidity of London Stock Exchange stocks pre and post earnings announcement can be seen in table 4.3.2.1. There is clear evidence from this table that spread increases significantly for stocks in London Stock Exchange after the earnings announcement. For example, on the actual day of the event, for firms in the FTSE100, the aggregate quote spread ratios compared to an average of 90 day pre

Table 4.3.2.1- Short-term and long-term effects of earnings announcements on Stock Market Liquidity – London Stock Exchange

Stock market liquidity is measured by the quoted, relative, and effective bid-ask spreads. Quoted bid-ask spread is defined as the ask price minus the bid price. Relative bid-ask spread is defined as the ask price minus the bid price divided by the quoted mid price. Effective bid-ask spread is defined as twice the absolute value of the difference between the transaction price and the mid price in effect at the time of the trade. All ratios in the table are computed as the ratio of the average bid-ask spreads of each individual stock over the indicated event time period to the average bid-ask spreads measure on day -90. The null hypothesis states that the mean of the reported ratio is equal to 1 is tested using a standard t-statistic.

	Quote		Relative		Effective	
	Ratio	t-statistic	Ratio	t-statistic	Ratio	t-statistic
FTSE100						
[0, 0]	1.36***	47.08	1.19***	23.52	1.44***	49.74
[-1, 1]	1.31***	40.19	1.23***	28.01	1.26***	29.50
[-2, 2]	1.19***	25.06	1.12***	14.81	1.15***	17.23
[-3, 3]	1.15***	19.61	1.09***	10.67	1.11***	12.35
[-4, 4]	1.12***	15.49	1.06***	7.59	1.08***	8.68
[-5, 5]	1.09***	11.42	1.04***	4.69	1.06***	7.20
[0, 10]	1.04***	5.90	0.98***	-2.25	1.04***	4.87
[0, 30]	1.04***	5.18	0.95***	-5.91	1.03***	2.84
[0, 60]	1.01	1.23	0.94***	-7.60	1.00	-0.38
[0, 90]	1.00	-0.54	0.92***	-9.27	0.99	-1.38
FTSE250						
[0, 0]	1.10***	11.70	1.11***	12.20	1.00	-0.10
[-1, 1]	1.13***	14.62	1.12***	13.51	1.03***	2.59
[-2, 2]	1.03***	3.73	1.04***	4.77	0.97***	-2.69
[-3, 3]	1.05***	6.08	1.04***	4.30	1.01	0.88
[-4, 4]	1.05***	6.23	1.03***	3.13	1.02	1.74
[-5, 5]	1.02***	2.78	1.01	1.33	0.99	-0.97
[0, 10]	1.00	-0.45	0.97***	-3.02	0.95***	-4.51
[0, 30]	0.96***	-5.07	0.95***	-6.10	0.92***	-7.17
[0, 60]	0.98***	-2.41	0.93***	-7.70	0.96***	-3.68
[0, 90]	0.95***	-6.14	0.90***	-11.57	0.93***	-6.12
FTSE Small Cap						
[0, 0]	1.18***	20.74	1.05***	10.50	1.14***	8.80
[-1, 1]	1.03***	3.76	1.02***	3.54	1.04***	2.66
[-2, 2]	1.02***	2.91	1.02***	3.44	1.07***	4.63
[-3, 3]	1.04***	4.87	1.00	0.49	1.10***	6.40
[-4, 4]	1.03***	3.99	1.00	0.07	1.11***	7.27
[-5, 5]	1.01	0.95	1.00	-0.49	1.06***	4.09
[0, 10]	0.99	-1.08	0.96***	-8.30	0.96***	-2.56
[0, 30]	1.01	0.65	0.95***	-11.14	1.01	0.70
[0, 60]	0.98***	-2.02	0.96***	-8.20	0.96***	-2.37
[0, 90]	0.98**	-1.91	0.97***	-6.15	0.98	-1.41

(Table 4.3.2.1 continued on following page)

(Table 4.3.2.1 continued from preceding page)

	Quote		Relative		Effective	
	Ratio	**t-statistic**	**Ratio**	**t-statistic**	**ratio**	**t-statistic**
FTSE AIM All Shares						
[0, 0]	1.07***	18.98	0.99***	-3.69	1.40***	14.59
[-1, 1]	1.03***	8.81	1.00***	-3.27	1.05***	2.02
[-2, 2]	1.02***	4.55	1.00***	-3.06	0.90***	-3.73
[-3, 3]	1.02***	4.30	0.99***	-3.95	0.88***	-4.42
[-4, 4]	1.01***	2.87	1.00***	-3.08	0.86***	-5.32
[-5, 5]	1.01***	2.16	0.99***	-3.88	0.81***	-7.00
[0, 10]	1.00	1.07	0.99***	-5.50	0.72***	-10.29
[0, 30]	1.01	1.45	1.00***	-2.03	0.78***	-7.95
[0, 60]	1.00	0.02	1.00	0.33	0.82***	-6.58
[0, 90]	0.99***	-4.09	1.00	1.66	0.81***	-6.83

* Significant at 10% level
** Significant at 5% level
*** Significant at 1% level

earnings announcement is 1.36, and thus highly significant. This indicates that the mean quoted spread is increased by 36% on that day compared to an average of 90 days pre event. In the [-5,+5] event window, the mean quoted spread ratio is 1.09, increased by 9%, and highly significant, this indicates that spreads are significantly increased over the 11 trading day period centred on the event day. For the relative and effective spread ratios in the FTSE100, the increases on event day are 19% and 44%, and the increases on [-5,5] window periods are 4% and 6% respectively.

Another important thing to report here is, that the spread ratios between post and pre earnings announcement period decreased gradually. As we observed from table 4.3.2.1, at the beginning, spread ratios between day 0 and average of 90 day pre earnings announcement are 1.36, 1.19, and 1.44 for quote, relative and effective bid asks respectively. After 30 days post earnings announcement period, spread ratios between average of 30 day post event and average of 90 day pre event reduce to 1.04, 0.95 and 1.03 for quote, relative and effective bid asks respectively. In the long term after 90 days post earnings announcement period, the 90 days pre/post earnings announcement spread ratios were reduced to 1, 0.92 and 0.99. This led to another conclusion; though there is decrease compared to pre earnings announcement period, stock liquidity has increased over time.

For firms in the FTSE250 the aggregate quote spread on day 0 compared to an average of quote spread of 90 days pre earnings announcement is 1.10, and is highly significant. This indicates that the mean quote spread increased 10% on the event day.

In the [-5,+5] event period, the mean quote spread is 1.02, increased by 2%, and highly significant, this indicates that spreads are significantly increased over the 11 trading day period centred on the event day. For the relative spread ratios in the FTSE250, there is an 11% increase on the event day, and 1% increase over [-5,5] event period. However for effective spread, the change is not clear, the increase is insignificant around day of earnings announcement and only significant on the day after.

Again, another important thing to report here is, that the spread ratios between post and pre earnings announcement period decreased over time for quoted and relative spread and in almost all event periods of effective spread. This led to another conclusion, though there is decrease compared to pre earnings announcement period, stock liquidity increased over time. In the long term at the end this ratio was slightly lower than 1 for all of the three spread ratios.

For firms in the FTSE Small Cap, the quote spread ratios when compared between aggregate average on day 0 and an average of 90 days pre earnings announcement is 1.18, and highly significant. This indicates that the mean quote spread increases by 18% on that day compared to an average of 90 days pre event. In the [-4,+4] event window, the mean quote spread is 1.03, increased by 3%, and is highly significant, this indicates that spreads have significantly increased over the 9 trading day period centred on the event day. The results also show the significant increase in the mean relative and effective spreads in short term: 5% and 14% increase on the event day for the relative and effective ratios respectively; and 2% over 5 trading day centred on event for relative ratio, 6% increase over 11 trading day centred on the event for effective ratio. In the long term, the spread ratios between post and pre earnings announcement period also decreased over time, a few cases are not significant for quote spread but the rest are highly significant, especially for relative and effective spreads.

Lastly, for firms in FTSE AIM All Shares, the quote spread ratios compared between mean quote spread on day 0 to an average quote spreads of 90 day pre earnings announcement is 1.07, and is highly significant. This indicates that the mean quote spread increase is 7% on that day compared to an average of 90 days pre event. In the [-5,+5] event period, the mean quoted spread is 1.01, increase in 1%, and highly significant, this indicates that spreads are significantly increased over the 11 trading day period centred on the event day. For the relative spread ratios in the FTSEAIM All Shares, the results show a significant decrease over the whole post earnings announcement period. For effective spread, results show 40% increase significantly in the bid ask spread mean ratio on the announcement day, and 5% increase over the 3 trading days. After that effective spread mean ration decreased lower than 1.

Overall in London Stock Exchange, bid ask spreads increase significantly due to the impact of earnings announcement. In the long term, bid ask spreads decrease with time. In other words, stock market liquidity in London Stock Exchange decreases dramatically after the earnings news, and then gradually improves over time.

4.3.2.2 American Stock Exchanges

The results of the changes in liquidity of the US stock exchanges pre and post earnings announcement can be seen in table 4.3.2.2. There is clear evidence from this table that spread increases significantly for stocks in the US markets after the earnings announcement. For example, for firms in DJIA the quote spread ratios compared between mean quote spread on event day to an average quote spread of 90 day pre earnings announcement is 1.72, and is highly significant. This indicates that the mean quoted spread increases by 72% on that day compared to an average of 90 days pre event. In the [-5,+5] event period , the mean quoted spread ratio is 1.13, increased by 13%, and is highly significant, which indicates that spreads are significantly increased over the 11 trading day period centred on the event day. For the relative and effective spread ratios in the DIJA, the increases on event day are 67% and 76%, and the increases on [-5, 5] event periods are 11% and 44% respectively.

A similar to the London Stock Exchange, another important thing to report here is; the spread ratios between post and pre earnings announcement period decrease with time in the long term. The ratios between mean spreads on the day 0 and that of average of 90 days pre earnings announcement are 1.72, 1.67 and 1.76 for quote, relative and effective bid ask spread respectively. Mean relative spread ratio between 90 days post and pre earnings announcement period reduced to 0.96. Those for quote and effective spreads reduced as well but only clearly (significantly) up to day 10. This led to another conclusion, due to impact of earnings announcement, in the short term, stock market liquidity decreases compared to pre earnings announcement period. In the long

Table 4.3.2.2- Short-term and long-term effects of earnings announcements on Stock Market Liquidity – The US markets.

Stock market liquidity is measured by the quoted, relative, and effective bid-ask spreads. Quoted bid-ask spread is defined as the ask price minus the bid price. Relative bid-ask spread is defined as the ask price minus the bid price divided by the quoted mid price. Effective bid-ask spread is defined as twice the absolute value of the difference between the transaction price and the mid price in effect at the time of the trade. All ratios in the table are computed as the ratio of the average bid-ask spreads of each individual stock over the indicated event time period to the average bid-ask spreads measure on day -90. The null hypothesis state that the mean of the reported ratio is equal to 1 is tested using a standard t-statistic.

	Quote		Relative		Effective	
	Ratio	**t-statistic**	**ratio**	**t-statistic**	**ratio**	**t-statistic**
DJIA						
[0, 0]	1.72***	56.36	1.67***	57.61	1.76***	35.74
[-1, 1]	1.48***	37.72	1.47***	40.47	1.88***	41.47
[-2, 2]	1.30***	23.29	1.28***	24.34	1.56***	26.38
[-3, 3]	1.19***	15.04	1.19***	16.51	1.50***	23.74
[-4, 4]	1.16***	12.27	1.14***	11.90	1.42***	19.90
[-5, 5]	1.13***	10.38	1.11***	9.68	1.44***	20.69
[0, 10]	1.05***	4.27	1.02*	1.85	1.14***	6.58
[0, 30]	0.98	-1.46	0.96***	-3.66	1.02	0.73
[0, 60]	0.97**	-1.98	0.95***	-4.69	0.99	-0.62
[0, 90]	1.01	0.94	0.96***	-3.17	1.03	1.56
NASDAQ100						
[0, 0]	1.38***	20.48	1.35***	21.57	1.57***	39.42
[-1, 1]	1.31***	17.03	1.29***	18.14	1.43***	29.41
[-2, 2]	1.23***	12.62	1.18***	11.09	1.24***	16.58
[-3, 3]	1.17***	9.29	1.17***	10.33	1.19***	12.78
[-4, 4]	1.12***	6.42	1.11***	7.10	1.13***	9.02
[-5, 5]	1.07***	3.67	1.08***	4.91	1.08***	5.47
[0, 10]	1.09***	5.00	1.11***	7.10	1.02	1.34
[0, 30]	1.10***	5.45	1.14***	8.88	0.93***	-4.56
[0, 60]	1.20***	10.59	1.23***	14.07	0.90***	-7.07
[0, 90]	1.30***	15.99	1.30***	18.43	0.90***	-6.78
S&P100						
[0, 0]	1.81***	84.34	1.66***	53.59	1.99***	57.45
[-1, 1]	1.50***	51.76	1.45***	36.69	1.76***	44.23
[-2, 2]	1.29***	29.69	1.24***	19.89	1.41***	23.63
[-3, 3]	1.22***	22.64	1.18***	14.80	1.34***	20.01
[-4, 4]	1.16***	17.12	1.13***	10.31	1.28***	16.05
[-5, 5]	1.13***	14.03	1.10***	7.95	1.24***	13.92
[0, 10]	1.08***	7.83	1.18***	15.05	1.20***	11.52
[0, 30]	1.01	1.00	1.04***	2.99	1.08***	4.72
[0, 60]	1.01	1.38	1.01	0.75	1.04***	2.53
[0, 90]	1.05	4.88	1.02	1.33	1.07	4.29

* Significant at 10% level
** Significant at 5% level
*** Significant at 1% level

term stock liquidity increased gradually though the increase does not last long as compared to London Stock Exchange.

For firms in the NASDAQ100, the quote spread ratios compared to an average of 90 day pre earnings announcement is 1.38, and is highly significant. This indicates that the mean quoted spread increase was 38% on that day compared to an average of 90 days pre the event. In the [-5,+5] event window, the mean quoted spread ratio is 1.07, increases 7%, and is highly significant, this indicates that spreads are significantly increased over the 11 trading day period centred on the event day. For the relative and effective spread ratios in the DIJA, the increases on event day are 35% and 57%, and the increase on [-5,5] window periods are 8% and 8% for each.

As similar to the London Stock Exchange, and the DIJA, another important thing to report for NASDAQ100 is, the spread ratios between post and pre earnings announcement period decreased with time over the long term. This led to a conclusion; though there is decrease compared to pre earnings announcement period, stock liquidity has increased over time. Over the long term at the end the spread ratio is slightly lower than 1 for effective spread mean ratio and still higher than 1 for quote spread mean ratio.

For firms in the S&P100 the quote spread ratios compared to an average of 90 days pre earnings announcement is 1.81, and highly significant. This indicates that the mean quoted spread increased 81% on that day compare to average of 90 days pre event. In the [-5,+5] event window, the mean quoted spread ratio is 1.13, increased by 13%, and highly significant, this indicates that spreads are significantly increased over the 11 trading day period centred on the event day. For the relative and effective spread ratios in DIJA, the increase on the event day are 66% and 99%, and the increase on the [-5, 5] event window periods are 10% and 24% respectively.

Similarly as in the above indices in London Stock Exchange, the DJIA and NASDAQ100, the spread ratios between post and pre earnings announcement period decreased with time over the long term. This led to a conclusion, though there is decrease compared to pre earnings announcement period, stock liquidity increases over time. Over 90 days spread ratios for this index are still higher than 1, it means that stock liquidity level has not recovered its original average level after 90 days.

4.3.2.3 Euronext Paris

Table 4.3.2.3- Short-term and long-term effects of earnings announcements on Stock Market Liquidity – Euronext Paris

Stock market liquidity is measured by the quoted, relative, and effective bid-ask spreads. Quoted bid-ask spread is defined as the ask price minus the bid price. Relative bid-ask spread is defined as the ask price minus the bid price divided by the quoted mid price. Effective bid-ask spread is defined as twice the absolute value of the difference between the transaction price and the mid price in effect at the time of the trade. All ratios in the table are computed as the ratio of the average bid-ask spreads of each individual stock over the indicated event time period to the average bid-ask spreads measure on day -90. The null hypothesis that the mean of the reported ratio is equal to one is tested using a standard t-statistic.

	Quote		Relative		Effective	
	Ratio	**t-statistic**	**ratio**	**t-statistic**	**ratio**	**t-statistic**
[0, 0]	0.80***	-10.58	0.84***	-8.88	0.67***	-17.04
[-1, 1]	0.73***	-14.59	0.85***	-8.70	0.72***	-14.82
[-2, 2]	0.72***	-14.81	0.78***	-12.21	0.70***	-15.76
[-3, 3]	0.75***	-13.64	0.80***	-11.27	0.74***	-13.77
[-4, 4]	0.70***	-16.05	0.76***	-13.79	0.70***	-15.85
[-5, 5]	0.72***	-15.16	0.77***	-12.89	0.73***	-14.31
[0, 10]	0.64***	-19.17	0.69***	-17.37	0.66***	-17.69
[0, 30]	0.61***	-20.74	0.66***	-19.41	0.63***	-19.45
[0, 60]	0.64***	-19.28	0.66***	-18.93	0.65***	-18.30
[0, 90]	0.66***	-18.29	0.66***	-19.23	0.66***	-17.59

* Significant at 10% level
** Significant at 5% level
*** Significant at 1% level

The results of the changes in liquidity of the Euronext Paris stock exchange pre and post earnings announcement can be seen in table 4.3.2.3. There is clear evidence from this table that the spread decreased significantly for stocks in the CAC40 markets after earnings announcement. For example, on the day of the event, for firms in the CAC40 the quote spread ratios compared to an average of 90 days pre earnings announcement is 0.80, and is highly significant. This indicates that the mean quoted spread decreased by 20% on that day compare to average of 90 days pre event. In the [-5,+5] event window, the mean quoted spread ratio is 0.72, decreased by 28%, and is highly significant, this indicates that spreads are significantly decreased over the 11 trading day period centred on the event day. For the relative and effective spread ratios in the CAC40, the decreases on event day are 16% and 33%, and the decreases on [-5,5] event periods are 23% and 27% respectively.

Similarly as in the US and the UK markets an important thing to report is, the spread ratios between post and pre earnings announcement period decreased with time in the long term. This led to the conclusion, though stock liquidity already increased compare to pre earnings announcement period, it increases by time. In the long term in the end spread ratios decrease up to 34% significantly.

4.3.3 Summary

In summary, this part of research investigates if earnings announcement creates a new information environment and how earnings news affects stock liquidity in different markets. My expectation is that with an improvement in the information environment, the stocks should be traded more and become more liquid. This part of the study however, shows that in post earnings announcement period, at first, bid ask spread increases (liquidity decrease) in the UK and the US markets. In the meantime, bid ask spread decreases (liquidity increase) in the French market. Why does this happen like that? As mentioned earlier that bid ask spread can be decomposed in the information asymmetry component and cost of trading component (which includes inventory holding cost and order processing cost) we can see that earnings news not only affect trading volume leading to the reduction in the cost of trading, but also increases the information asymmetry component in the bid ask spread. The reason for this is that when news is released, not everyone can approach the news in the same way. There will be investors who have advantages over other groups of investors. Therefore, earnings news once released will create a gap between informed and uninformed traders. This gap has usually been referred to as information asymmetry component in the bid ask spread. When the earnings news is released, this gap increases and it will in turn make the total bid ask spread increase. The uninformed traders can infer the extra information the insiders have by observing whatever they buy or cell.

Now we can see that, the overall impact of earnings news on the bid ask spread will be the total of the above two effects. If the increase in information asymmetry component is dominant, then the total bid ask spread will increase (stock liquidity decreases). If the decrease in cost of trading component is dominant, then the total bid ask spread will decrease (stock liquidity increases). What happened on the London Stock Exchange and the US markets suggests that the information asymmetry component dominates bid ask spread (stock liquidity) in those two common law countries; what happened on the Euronext Paris market suggests that the cost of trading component dominated bid ask spread (stock liquidity) in French market. This happened exactly as we expected from a code law country where earnings information is released through different channel before the earnings announcement, and so it plays a less dominant role.

Another point of notice in the results is that even though stock liquidity decreases (bid ask spread increases) in the common law countries as US and UK, and stock liquidity increases (bid ask spread decreases) in the code law country as France for the whole studied period of 90 days post earnings announcement, we can see that over time, stock liquidity increased (bid ask spread decreased) in all the three countries: the UK and the US and French markets. This evidence is seen in the gradual decrease in the bid ask spread ratios if we look at the different short term periods in tables from 4.3.1.1 to 4.3.1.8. The reason for this being, as the time passes the information asymmetry in the news has less impact while trading volume still increases due to the news and by its own time linear function, leading to the continuous improvement in liquidity. This issue will be shown more clearly in the results of the next chapter (Chapter V).

4.4. Conclusion

Overall, this chapter provides the following conclusions:

First of all, significant positive (negative) stock price reactions to the good (bad) earnings announcements are reported, providing a clear evidence of earnings news's impact on price after earnings announcement. This is consistent with previous literature on the US data and FTSE100, FTSE AIM All Shares and some other studied emerging markets. The increases/decreases in price are permanent. After the change has taken place, price does not go down or up to the original level as shown graphically and statistically. The good news has a longer impact while bad news ends quickly, except in the case of the NASDAQ100 where the good news for high tech firms seems to have more weight. Similarly as in the common law countries such as the US and the UK and in the code law country such as France, though earnings information were conveyed to the markets up to one month before the earnings announcement date, the reaction is still strongest on the announcement date and gradually reduces over subsequent days.

With respect to the dramatic increase in trading volume after the earnings news, we can argue that stock liquidity has changed after the information was conveyed to the market, adding to the increase caused by a linear time trend. The impact of the news on trading volume is most profound when the news is released. After the announcement date, the news continues to have effects on trading volume. Trading volume keeps increasing day after day, however the impact level is less aggressive and gradually decreases compared to the announcement day.

Due to earnings announcement, the information environment is richer and stock will be traded more and become more liquid. However, evidence from LSE and from NYSE/NASDAQ/CBOE shows that bid ask spread increases/stock liquidity decreases after the earnings announcement while evidence from Paris Bourse shows that bid ask spread decreases/stock liquidity increases after earnings announcement.

This leads to another argument that, the part of the stock liquidity increased due to trading volume effect has been deducted by the decrease in other component. The overall impact in the short term is that the stock liquidity decreased in the UK and the US markets, while increased in the French market. Since the trading volume increases, it will cause the inventory holding cost and order processing cost components in stock liquidity to decrease. Hence, with an overall decrease in liquidity in the US and the UK markets, the last component of stock liquidity, *information asymmetry cost*, must dominate in the US and the UK. Meanwhile, an overall increase in the liquidity in the French market must be dominated by inventory holding cost and order processing cost components (or cost of trading component). The information content in the common law countries such as the US, and the UK plays an important role while the information content in stock liquidity in France seems to play a less dominant role. Again, this happens as we expected due to the differences in the common law countries and code law country, earnings announcement provide more uncertainty in the common law system than in the code law system, due to the fact that news is conveyed to the market since 1 month before the announcement date through different channels. However, note be taken that there is still something surprising here, even though the news has been leaked before the announcement, we still see the post earnings announcement drift after the official announcement dates.

In the long term, stock liquidity in both common law and code law systems increases with time after earnings announcement. This is due to the fact that the information content becomes less impacting and diminishes with time. Meanwhile both factors with respect to volume: the linear time trend increase in volume; or the trading volume effects caused by earnings news still continues, leading to the continuous improvement in liquidity. In both the cases, it points out that the information asymmetry component plays a less role when news is completely conveyed to the markets. To have a closer look at the role of information asymmetry component in liquidity we will study these issues in Chapter VI. At this point, based on the results from this chapter I will incorporate all of the possible factors that could affect stock liquidity in a multi-variate analysis model in the following chapter.

CHAPTER V

MULTI-VARIATE ANALYSIS OF THE LONG TERM IMPACT OF EARNINGS ANNOUNCEMENT ON STOCK MARKET LIQUIDITY

The empirical results in the previous chapter are uni-variate analysis of earnings announcement's impact on the stock market liquidity. However, univariate analysis may omit other factors related to the earnings announcement. Gregoriou, Ioannidis and Skerratt (2005) reported that bid ask spread increases with returns volatility and decreases with stock price and trading volume in the LSE. Atkins and Dyl (1997) also reported similar relationships for stock in the NYSE and the NASDAQ. Chapter IV has established the relationship between stock liquidity and those possible explanatory variables. To control for these possible explanatory factors, in this chapter, I carry out a multi-variate analysis of the long-term impacts of earnings announcements on stock market liquidity. Part 5.1 describes the methodology and model specification. Part 5.2 presents diagnostic tests, empirical results and explanations. Part 5.3 gives conclusion of the findings.

5.1. Methodologies

My empirical analysis also drives from the approach of Hedge and Mc Dermott (2003) and Gregoriou (2008) in their studies of the effect of addition to and deletion from an index on stock liquidity. I implemented a test using a log linear panel regression model with GMM estimator. Gregoriou et al (2005) report that the bid ask spread increase with return volatility and decrease with stock price and trading volume in London Stock Exchange. Atkins and Dyl (1997) also report the similar relationship for the stock in NYSE and NASDAQ. After control for volatility of stock returns, average stock price and trading volume, the model will explores whether the average market liquidity of stocks increase after earnings announcements.

$$Illiqidity_{it} = \alpha_i + \beta_1 D_t + \beta_2 \ln Volume_{it} + \beta_3 (\ln Volume_{it} * D_t) + \\ + \beta_4 \ln Price_{it} + \beta_5 (\ln Price_{it} * D_t) + \beta_6 Stdev_{it} + \varepsilon_{it} \quad (5.1.1)$$

Where,

- i = 1, 2 .... number of stock in each sample index.
- t = 1,2*;* where t = 1 corresponds to the pre earnings announcements [-90,-1], and t = 2 correspond to the post earnings announcements period, [0,90].
- $Illiqidity_{it}$ refers to either the natural logarithm of quoted, relative or effective bid-ask spreads for stock i at closing market at time t.
- *lnVolume* represents natural logarithm of trading volume for stock i at time t. Trading volume is calculated as the product of the average of high prices and low prices on the day times the number of shares traded on the day.
- *lnPrice* refers to natural logarithm of daily closing price for stock i at time t.
- *Stdev* refers to moving standard deviation of daily returns for stock i with n=5 data points.
- The Dummy variable is equal to 1 in the post earnings announcements and equal to 0 pre earnings announcements.
- α_j capture the time-invariant unobserved stock specific fixed effect.

In this model, I employed an intercept dummy variable to discover any change in the stock illiquidity due to the event. As reported from previous chapter's empirical work, trading volume not only responses dramatically due the news, but also increases by time during the whole studied period. Therefore, not only trading volume but also an interaction term between the dummy and trading volume should be included To analyse the impact of earnings announcements on stock liquidity, I am mainly concerned with $\beta 1$, the change in slope of dummy variable and $\beta 3$, the change in the slope of trading volume, and $\beta 5$, the change in the slope of stock price before and after the event.

Ordinary Least Square does not account for the likely presence of endogeneity between the explanatory variables trading volume, stock price and returns volatility. The Instrumental Variable estimator can remove problem of endogeneity however, it fails to capture cross stock heterogeneity. Generalized Method of Movement panel

Estimator established by Arellando and Bond (1991) can overcome the above two shortcomings therefore it is used in this analysis. The one to four time period lagged dependant variables and regressors are added to the model as instrumental variables.

5.2 Diagnostic tests and empirical results

The panel passed most of the diagnostic tests across indices in the samples used in this thesis. The fix effect of the panel α_i is significant with a p value of zero, for all indices[40], it means that the differences in the initial levels of stock liquidity in the sample are successfully captured by the panel estimator. The test for first order residual serial correlation however, is significant, suggesting that the panel does suffer from autocorrelation. The residual of the panel is also not normally distributed, signalling that the results presented in the following part might be due to outliers in the data. However, the Sargan tests confirm the validity of the instruments in the model[41].

The estimation outputs using GMM method are presented from table 5.2.1.1 to 5.2.1.8.

5.2.1 London Stock Exchange

5.2.1.1 FTSE 100.

The constant αi for FTSE 100 is significant in al the three bid-ask spreads, which means that the differences in the initial levels of liquidity of the stocks are captured by GMM estimators.

After controlling for the impact of trading volume, share prices and volatility, in the effective spread model, the significance of intercept dummy coefficient *β1* shows that the quote and relative bid-ask spreads increase (liquidity decrease) on average by 0.30% after earnings announcements; the effective spread increases on average 0.38% after earnings announcements. *β2* indicates that quote and relative bid-ask spreads decrease by 0.25%, the effective bid-ask spreads decrease by 0.19% when average trading volume increases by 1%. The interaction term *β3* is significant in three spread models showing that in the long term the decrease in quote, relative and effective bid-ask spreads due to 1% trading volume change are 0.02%, 0.02%, and 0.03 % srespectively. The interaction term *β5* is statistically insignificant in three spread

[40] See tables from 5.2.1 to 5.2.8
[41] See results tables in 5.2.1 to 5.2.8

Table 5.2.1.1. FTSE 100. Multi variate analysis of the long term impact of earnings announcement on stock market liquidity

The sample consists of 99 FTSE100 firms that have data available for 181 days around earnings announcement date in the financial year 2006-2007. A log linear panel fixed effects regression model estimated with the use of Arellano and Bond (1991) GMM estimator is used. The panel is used to determine whether the average market liquidity of the stock change after earnings announcement after controlling for stock prices, trading volume and volatility of stock returns. In addition, β_3 and $\beta_5$test if the slope coefficients on trading volume and price have changed following earnings announcement. The model has following specification:

$$Illiqidity_{it} = \alpha_i + \beta_1 D_t + \beta_2 \ln Volume_{it} + \beta_3(\ln Volume_{it} * D_t) + \\ + \beta_4 \ln Price_{it} + \beta_5(\ln Price_{it} * D_t) + \beta_6 Stdev_{it} + \varepsilon_{it}$$

For j=1,2 ….90 and t=1,2; where t=1 corresponds to the pre-earnings announcement of 99 firms on the FTSE 100, [0,-90], and t=2 corresponds to the post earnings announcement of 99 firms on the FTSE 100, [0,+90]. The dependant variable $Illiquidity_{it}$ correspondent to either quoted, relative or effective bid ask spread for stock j at time period t. Quoted spread is defined as the difference between the ask price and the bid price. Relative bid ask spread is defined as the ask price minus the bid price divided by the quoted mid-price. Effective bid ask spread is defined as twice as much as the absolute value of the difference between the transaction price and the mid price in effect at the time of the trade. $Volume_{it}$, $Price_{it}$, and $Stdeve_{it}$ represent the traded volume in money, closing price and return volatility for stock j at time t. The dummy variable D_t is equal to 1 in the post earnings announcement period, and is equal to 0 otherwise. All the variables apart from D_t are taken in their natural logarithms. αj capture the time-invariant unobserved stock specific fixed effects. AR(1) is the first order Lagrange Multiplier test performed on the first difference of the residuals is because of the transformations involved. Sargan test follow a Chi-squared distribution with r degree of freedom under the null hypothesis of valid instruments. NORM(2) is the p-value for the Jaque-Bera normality test. The endogenous explanatory variables (all variables apart from D_t) in the panel are GMM instrumented setting z≥1. [.] are p value and (.) are t statistics.

Coefficient	Variables	Quote Bid-ask spreads	Relative Bid-ask spreads	Effective Bid-ask spreads
Constantα_j	Ai	-1.56***	-1.56***	-2.51***
β1	Dt	0.30*	0.30*	0.38***
β2	lnVolume	-0.25***	-0.25***	-0.19***
β3	lnVolume*Dt	-0.02*	-0.02*	-0.03***
β4	lnPrice	0.83***	-0.17***	0.79***
β5	lnPrice*Dt	0.0003	0.0003	0.0004
β6	Moving StDev	12.56***	12.56***	10.39***
α_j		[0.00]	[0.00]	[0.00]
AR(1)		[0.00]	[0.00]	[0.00]
J statistic		11	35	16
Sargan test		[0.28]	[0.28]	[0.56]
NORM(2)		0.00	0.00	0.00
Adjusted R^2		0.56	0.24	0.53

* Significant at 10% level
** Significant at 5% level
*** Significant at 1% level

models showing that the change due to event (associated with intercept dummy) is constant effect.

β4 and *β6* are significant for three measures of bid-ask spread, which shows that stock liquidity is explained by the price and price volatility.

The J statistic is simply the Sargan statistic and the instrument rank larger than the number of estimated coefficient; I use it to construct the Sargan test of over identifying restrictions. Under the null hypothesis that the over-identifying restrictions are valid, the Sargan statistic is distributed as a $\chi^2, (p-k)$, where k is the number of estimated coefficients and p is the instrument rank. The p-value of 0.28, 0.28 and 0.63 in this example do not rejects null hypothesis of over-identifying instrumental variables, that is the error term is uncorrelated with the instruments. The R^2 indicates that 56% of the variation in the liquidity is explained by the quote spread model; 24% for relative spread model and 53 % for the effective spread model.

The panel does not pass the test of the residual serial correlation, and the normality test.

5.2.1.2. FTSE250.

The constant αi for the FTSE 250 is significant in all three the bid-ask spreads, which means that the difference in the initial levels of liquidity of the stocks is captured by the GMM estimators.

After controlling for the impact of trading volume, share prices and volatility, in the effective spread model, the significance of intercept dummy coefficient β1 shows that the quote and relative bid-ask spreads increase (liquidity decrease) on average by 0.53% after earnings announcements and the effective bid-ask spreads increase by 0.43%. β2 indicates that quote and relative bid-ask spreads decrease 0.48% and effective spread decrease 0.38% when trading volume increases by 1%. The interaction term β3 is significant showing that the bid-ask spreads due to 1% trading volume change are even further decreased by 0.04% for all the models: quote, relative and effective bid-ask spread models, due to the impact of earnings announcements. The interaction term *β5* is statistically insignificant in three spread models showing that the change due to event (associated with intercept dummy) is constant effect.

Table 5.2.1.2. FTSE 250. Multi variate analysis of the long term impact of earnings announcement on stock market liquidity

The sample consists of 233 FTSE250 firms that have data available for 181 days around earnings announcement date in the financial year 2006-2007. A log linear panel fixed effects regression model estimated with the use of Arellano and Bond (1991) GMM estimator is used. The panel is used to determine whether the average market liquidity of the stock change after earnings announcement after controlling for stock prices, trading volume and volatility of stock returns. In addition, β_3 and β_5 test if the slope coefficients on trading volume and price have changed following earnings announcement. The model has following specification:

$$Illiqidity_{it} = \alpha_i + \beta_1 D_t + \beta_2 \ln Volume_{it} + \beta_3(\ln Volume_{it} * D_t) + \\ + \beta_4 \ln Price_{it} + \beta_5(\ln Price_{it} * D_t) + \beta_6 Stdev_{it} + \varepsilon_{it}$$

For j=1,2 ….90 and t=1,2; where t=1 corresponds to the pre-earnings announcement of 99 firms on the FTSE 100, [0,-90], and t=2 corresponds to the post earnings announcement of 99 firms on the FTSE 100, [0,+90]. The dependant variable $Illiquidity_{it}$ correspondent to either quoted, relative or effective bid ask spread for stock j at time period t. Quoted spread is defined as the difference between the ask price and the bid price. Relative bid ask spread is defined as the ask price minus the bid price divided by the quoted mid-price. Effective bid ask spread is defined as twice as much as the absolute value of the difference between the transaction price and the mid price in effect at the time of the trade. $Volume_{it}$, $Price_{it}$, and $Stdeve_{it}$ represent the traded volume in money, closing price and return volatility for stock j at time t. The dummy variable D_t is equal to 1 in the post earnings announcement period, and is equal to 0 otherwise. All the variables apart from D_t are taken from their natural logarithms. αj captures the time-invariant unobserved stock specific fixed effects. AR(1) is the first order Lagrange Multiplier test performed on the first difference of the residuals because of the transformations involved. Sargan test follow a Chi-squared distribution with r degree of freedom under the null hypothesis of valid instruments. NORM(2) is the p-value for the Jaque-Bera normality test. The endogenous explanatory variables (all variables apart from D_t) in the panel are GMM instrumented setting z≥1. [.] are p value and (.) are t statistics.

Coefficient	Variables	Quote Bid-ask spreads	Relative Bid-ask spreads	Effective Bid-ask spreads
Constantα_j	Ai	1.13***	1.13***	-0.23**
β1	Dt	0.53***	0.53***	0.43***
β2	lnVolume	-0.48***	-0.48***	-0.38***
β3	lnVolume*Dt	-0.04***	-0.04***	-0.04**
β4	LnPrice	0.92***	-0.08***	0.86***
β5	LnPrice*Dt	-0.0001	-0.0001	-0.0002
β6	Moving StDev	12.74***	12.74***	12.05***
α_j		[0.00]	[0.00]	[0.00]
AR(1)		[0.00]	[0.00]	[0.00]
J statistic		56	56	41
Sargan test		0.24	0.23	0.47
NORM(2)		0.00	0.00	0.00
Adjusted R^2		0.56	0.30	0.31

* Significant at 10% level
** Significant at 5% level
*** Significant at 1% level

β4 and *β6* are significant for three measures of bid-ask spread, which shows that stock liquidity is explained by the price and price volatility.

The Sargan test is insignificant, which means that the error term is uncorrelated with the instruments, in the other words, it rejects the possibility of over-identifying instrumental variables. The R^2 indicates that 56% of the variation in the liquidity is explained by the quote bid-ask spreads model, 30% is explained by relative spread model and 31% by the effective model.

However, the panel does not pass the normality test and the test of the first order residual serial correlation, propose a non-linear relationship between variables.

5.2.1.3 FTSE Small Cap.

The constant αi for the FTSE Small Cap is significant in all the three bid-ask spreads, which means that the differences in the initial levels of liquidity of the stocks are captured by GMM estimators.

After controlling for the impact of trading volume, share prices and volatility, in the effective spread model, the significance of intercept dummy coefficient β1 shows that the quote bid-ask spreads increase (liquidity decrease) on average by 0.55%, the relative bid-ask spreads increase by 0.54% and the effective bid-ask spreads increase by 0.36% the after earnings announcements. β2 indicates that quote and relative bid-ask spreads decrease by 0.47% and effective bid-ask spreads decrease by 0.23% when trading volume increases by 1%. The interaction term β3 is significant, showing that the decrease in bid-ask spreads due to 1% trading volume change caused by the impact of earnings announcements are 0.06%, 0.06%; 0.03% for quote spread, relative spread and effective spread respectively. Finally, the interaction term *β5* is statistically insignificant in three spread models showing that the change due to event (associated with intercept dummy) is constant effect.

β4 and *β6* are significant for three measures of bid-ask spread, which shows that stock liquidity is explained by the price and price volatility.

The Sargan test is insignificant, rejects the possibility of over-identifying instrumental variables, which means that the instruments are valid.

Table 5.2.1.3. FTSE Small Cap. Multi variate analysis of the long term impact of earnings announcement on stock market liquidity

The sample consists of 310 FTSE Small Cap firms that have data available for 181 days around earnings announcement date in the financial year 2006-2007. A log linear panel fixed effects regression model estimated with the use of Arellano and Bond (1991) GMM estimator is used. The panel is used to determine whether the average market liquidity of the stock change after earnings announcement after controlling for stock prices, trading volume and volatility of stock returns. In addition, β_3 and β_5 test if the slope coefficients on trading volume and price have changed following earnings announcement. The model has the following specification:

$$Illiqidity_{it} = \alpha_i + \beta_1 D_t + \beta_2 \ln Volume_{it} + \beta_3 (\ln Volume_{it} * D_t) + \\ + \beta_4 \ln Price_{it} + \beta_5 (\ln Price_{it} * D_t) + \beta_6 Stdev_{it} + \varepsilon_{it}$$

For j=1,2 ….90 and t=1,2; where t=1 corresponds to the pre-earnings announcement of 99 firms on the FTSE 100, [0,-90], and t=2 corresponds to the post earnings announcement of 99 firms on the FTSE 100, [0,+90]. The dependant variable $Illiquidity_{it}$ corresponds to either quoted, relative or effective bid ask spread for stock j at time period t. Quoted spread is defined as the difference between the ask price and the bid price. Relative bid ask spread is defined as the ask price minus the bid price divided by the quoted mid-price. Effective bid ask spread is defined as twice as much as the absolute value of the difference between the transaction price and the mid price in effect at the time of the trade. $Volume_{it}$, $Price_{it}$, and $Stdeve_{it}$ represent the traded volume in money, closing price and return volatility for stock j at time t. The dummy variable D_t is equal to 1 in the post earnings announcement period, and is equal to 0 otherwise. All the variables apart from D_t are taken in their natural logarithms. αj captures the time-invariant unobserved stock specific fixed effects. AR(1) is the first order Lagrange Multiplier test performed on the first difference of the residuals because of the transformations involves. Sargan test follow a Chi-squared distribution with r degree of freedom under the null hypothesis of valid instruments. NORM(2) is the p-value for the Jaque-Bera normality test. The endogenous explanatory variables (all variables apart from D_t) in the panel are GMM instrumented setting z≥1. [.] are p value and (.) are t statistics.

Coefficient	Variables	Quote Bid-ask spreads	Relative Bid-ask spreads	Effective Bid-ask spreads
Constantα_j	Ai	0.76***	0.73***	-1.33***
β1	Dt	0.55**	0.54**	0.36*
β2	lnVolume	-0.47***	-0.47***	-0.23***
β3	lnVolume*Dt	-0.06*	-0.06*	-0.03*
β4	LnPrice	0.94***	-0.06***	0.75***
β5	LnPrice*Dt	-0.0006	-0.0007	-0.0047
β6	Moving StDev	15.49***	15.41***	13.89***
α_j		[0.00]	[0.00]	[0.00]
AR(1)		[0.00]	[0.00]	[0.00]
J statistic		24	24	7.55
Sargan test		0.17	0.17	0.23
NORM(2)		0.00	0.00	0.00
Adjusted R2		0.45	0.31	0.31

* Significant at 10% level
** Significant at 5% level
*** Significant at 1% level

The R^2 indicates that 45% of the variation in the liquidity is explained by the quote model, 37% is explained by relative model, and 31% is explained by the effective model.

However, the panel does not pass the normality test and the test of the first order residual serial correlation, proposes a non-linear relationship between variables.

5.2.1.4 FTSE AIM All shares.

The constant αi for FTSE AIM All Shares is significant in all three measures of bid-ask spreads, which means that the differences in the initial levels of liquidity of the stocks are captured by GMM estimators.

After controlling for the impact of trading volume, share prices and volatility, in the effective spread model, the significance of intercept dummy coefficient $\beta 1$ shows that the effective bid-ask spreads does not change significantly after earnings announcements. The quote and relative spread increased (liquidity decrease) by 0.07%. The interaction term $\beta 3$ in effective spread model is insignificant, showing that the effective bid-ask spreads are persistent after earnings announcements. The interaction term $\beta 3$ in quoted spread and relative spread models is significant and has negative sign, which means that, due to the interaction of 1% increase in trading volume, quote and relative spread will decrease (liquidity increase) by -0.01%. Finally, the interaction term $\beta 5$ is statistically insignificant in three spread models showing that the change due to event (associated with intercept dummy) is constant effect.

$\beta 4$ and $\beta 6$ are significant for three measures of bid-ask spread, which shows that stock liquidity is explained by the price and price volatility.

The Sargan test is insignificant, means that the instruments are valid. The R^2 indicates that 91% of the variation in the liquidity is explained by the quote model, 81% is explained by relative model, and 74% is explained by the effective model.

The panel does not pass the normality test and the test of the first order residual serial correlation, propose a non-linear relationship between variables and outliers in data.

Table 5.2.1.4. FTSE AIM All Shares. Multi variate analysis of the long term impact of earnings announcement on stock market liquidity

The sample consists of 913 FTSE AIM All Shares firms that have data available for 181 days around earnings announcement date in the financial year 2006-2007. A log linear panel fixed effects regression model estimated with the use of Arellano and Bond (1991) GMM estimator is used. The panel is used to determine whether the average market liquidity of the stock changes after earnings announcement after controlling for stock prices, trading volume and volatility of stock returns. In addition, β_3 and β_5 test if the slope coefficients on trading volume have changed following earnings announcement. The model has following specification:

$$Illiqidity_{it} = \alpha_i + \beta_1 D_t + \beta_2 \ln Volume_{it} + \beta_3 (\ln Volume_{it} * D_t) + \\ + \beta_4 \ln Price_{it} + \beta_5 (\ln Price_{it} * D_t) + \beta_6 Stdev_{it} + \varepsilon_{it}$$

For j=1, 2 ….90 and t=1, 2; where t=1 corresponds to the pre-earnings announcement of 99 firms on the FTSE 100, [0,-90], and t=2 corresponds to the post earnings announcement of 99 firms on the FTSE 100, [0, +90]. The dependant variable $Illiquidity_{it}$ corresponds to either quoted, relative or effective bid ask spread for stock j at time period t. Quoted spread is defined as the difference between the ask price and the bid price. Relative bid ask spread is defined as the ask price minus the bid price divided by the quoted mid-price. Effective bid ask spread is defined as twice as much as the absolute value of the difference between the transaction price and the mid price in effect at the time of the trade. $Volume_{it}$,$Price_{it}$, and $Stdeve_{it}$ represent the traded volume in money, closing price and return volatility for stock j at time t. The dummy variable D_t is equal to 1 in the post earnings announcement period, and is equal to 0 otherwise. All the variables apart from D_t are taken in their form of natural logarithms. αj captures the time-invariant unobserved stock specific fixed effects. AR(1) is the first order Lagrange Multiplier test performed on the first difference of the residuals because of the transformations involved. Sargan test follow a Chi-squared distribution with r degree of freedom under the null hypothesis of valid instruments. NORM(2) is the p-value for the Jaque-Bera normality test. The endogenous explanatory variables (all variables apart from D_t) in the panel are GMM instrumented setting z≥1. [.] are p value and (.) are t statistics.

Coefficient	Variables	Quote Bid-ask spreads	Relative Bid-ask spreads	Effective Bid-ask spreads
Constantα_j	Ai	-1.62***	-1.62***	-6.47***
β1	Dt	0.07**	0.07***	0.27
β2	lnVolume	0.02***	0.02***	-0.01
β3	lnVolume*Dt	-0.01**	-0.01***	-0.03
β4	LnPrice	0.63***	-0.37***	1.35***
β5	LnPrice*Dt	0.008	0.008	-0.047
β6	Moving StDev	-4.34***	-4.30***	1.46**
α_j		[0.00]	[0.00]	[0.00]
AR(1)		[0.00]	[0.00]	[0.00]
J statistic		22	21	19
Sargan		0.27	0.23	0.41
NORM(2)		0.01	0.01	0.00
Adjusted R2		0.91	0.81	0.71

* Significant at 10% level
** Significant at 5% level
*** Significant at 1% level

5.2.2. The US Stock Exchanges

5.2.2.1. DJIA.

Table 5.2.2.1. DJIA. Multi variate analysis of the long term impact of earnings announcement on stock market liquidity

The sample consists of 30 DJIA firms that have data available for 181 days around earnings announcement date in the financial year 2006-2007. A log linear panel fixed effects regression model estimated with the use of Arellano and Bond (1991) GMM estimator is used. The panel is used to determine whether the average market liquidity of the stock change after earnings announcement after controlling for stock prices, trading volume and volatility of stock returns. In addition, β_3 and β_5 test if the slope coefficients on trading volume and price have changed following earnings announcement. The model has following specification:

$$Illiqidity_{it} = \alpha_i + \beta_1 D_t + \beta_2 \ln Volume_{it} + \beta_3(\ln Volume_{it} * D_t) + \\ + \beta_4 \ln Price_{it} + \beta_5(\ln Price_{it} * D_t) + \beta_6 Stdev_{it} + \varepsilon_{it}$$

For j=1,2 ….90 and t=1,2; where t=1 corresponds to the pre-earnings announcement of 99 firms on the FTSE 100, [0,-90], and t=2 corresponds to the post earnings announcement of 99 firms on the FTSE 100, [0,+90]. The dependant variable $Illiquidity_{it}$ correspondent to either quoted, relative or effective bid ask spread for stock j at time period t. Quoted spread is defined as the difference between the ask price and the bid price. Relative bid ask spread is defined as the ask price minus the bid price divided by the quoted mid-price. Effective bid ask spread is defined as twice as much as the absolute value of the difference between the transaction price and the mid price in effect at the time of the trade. $Volume_{it}$, $Price_{it}$, and $Stdeve_{it}$ represents the traded volume in money, closing price and return volatility for stock j at time t. The dummy variable D_t is equal to 1 in the post earnings announcement period, and is equal to 0 otherwise. All the variables apart from D_t are taken from their natural logarithms. αj captures the time-invariant unobserved stock specific fixed effects. AR(1) is the first order Lagrange Multiplier test performed on the first difference of the residuals because of the transformations involved. Sargan test follow a Chi-squared distribution with r degree of freedom under the null hypothesis of valid instruments. NORM (2) is the p-value for the Jaque-Bera normality test. The endogenous explanatory variables (all variables apart fromD_t) in the panel are GMM instrumented setting z≥1. [.] are p value and (.) are t statistics.

Coefficient	Variables	Quote Bid-ask spreads	Relative Bid-ask spreads	Effective Bid-ask spreads
Constantα_j	Ai	-3.86***	-3.86***	-8.83***
β1	Dt	0.58	0.58**	2.06
β2	lnVolume	-0.17***	-0.17***	0.36**
β3	lnVolume*Dt	-0.04***	-0.04**	-0.15
β4	LnPrice	0.65***	-0.35***	-0.18
β5	LnPrice*Dt	0.13	0.13	-0.07
β6	Moving StDev	6.67***	6.67***	10.03
α_j		[0.00]	[0.00]	[0.00]
AR(1)		[0.00]	[0.00]	[0.02]
J statistic		21	21	19
Sargan test		0.62	0.62	0.38
NORM(2)		0.01	0.00	0.00
Adjusted R^2		0.38	0.26	0.17

* Significant at 10% level
** Significant at 5% level
*** Significant at 1% level

The constant αi for DJIA is significant in all three bid-ask spreads, which means that the differences in the initial levels of liquidity of the stocks are captured by GMM estimators.

After controlling for the impact of trading volume, share prices and volatility, in the quote and effective spread model, intercept dummy *β1* is insignificant and shows that the effective bid-ask spreads are persistent over the long term after earnings announcements. However, the quoted and relative bid ask spreads increase (liquidity decrease) significantly due to the earnings announcement. The interaction term *β3* in effective spread model is insignificant showing that the bid-ask spreads does not change due to trading volume change after earnings announcements. However, the interaction terms *β3* for quoted and relative spread model are significant and shows that quoted and relative spreads decrease (stock liquidity increase) by 0.04% due to the interaction of 1% increase in trading volume. Finally, the interaction term *β5* is statistically insignificant in three spread models showing that the change due to event (associated with intercept dummy) is constant effect.

β4 and *β6* are significant for three measures of bid-ask spread, which shows that stock liquidity is explained by the price and price volatility.

The Sargan test is insignificant, shows the appropriateness of the instrumental variables. The R^2 indicates that 38% of the variation in the liquidity is explained by the quote model, 26% is explained by relative model, and 17% is explained by the effective model.

Models might suffer from auto-correlation and outlier in data based on the result of first order Lagrange Multiplier test performed on the first difference of the residuals, and Jaque-Berra test for normality.

5.2.2.2 NASDAQ100.

The constant αi for the NASDAQ100 is significant in all the three bid-ask spreads, which means that the differences in the initial levels of liquidity of the stocks are captured by GMM estimators.

After controlling the impact of trading volume, share prices and volatility, the significance of *β1* shows that the bid-ask spreads increased (liquidity decrease) on an average by 0.59%, 0.59%, and 0.74% for quoted spread model, relative spread model and effective spread models respectively, after earnings announcements. *β2* indicates

Table 5.2.2.2. NASDAQ 100. Multi variate analysis of the long term impact of earnings announcement on stock market liquidity

The sample consists of 96 NASDAQ100 firms that have data available for 181 days around earnings announcement date in the financial year 2006-2007. A log linear panel fixed effects regression model estimated with the use of Arellano and Bond (1991) GMM estimator is used. The panel is used to determine whether the average market liquidity of the stock change after earnings announcement after controlling for stock prices, trading volume and volatility of stock returns. In addition, β_3 and β_5 test if the slope coefficients on trading volume and price have changed following earnings announcement. The model has the following specification:

$$Illiqidity_{it} = \alpha_i + \beta_1 D_t + \beta_2 \ln Volume_{it} + \beta_3(\ln Volume_{it} * D_t) + \\ + \beta_4 \ln Price_{it} + \beta_5(\ln Price_{it} * D_t) + \beta_6 Stdev_{it} + \varepsilon_{it}$$

For j=1, 2 ….90 and t=1, 2; where t=1 corresponds to the pre-earnings announcement of 99 firms on the FTSE 100, [0,-90], and t=2 corresponds to the post earnings announcement of 99 firms on the FTSE 100, [0, +90]. The dependant variable $Illiquidity_{it}$ correspondent to either quoted, relative or effective bid ask spread for stock j at time period t. Quoted spread is defined as the difference between the ask price and the bid price. Relative bid ask spread is defined as the ask price minus the bid price divided by the quoted mid-price. Effective bid ask spread is defined as twice as much as the absolute value of the difference between the transaction price and the mid price in effect at the time of the trade. $Volume_{it}$, $Price_{it}$, and $Stdeve_{it}$ represents the traded volume in money, closing price and return volatility for stock j at time t. The dummy variable D_t is equal to 1 in the post earnings announcement period, and is equal to 0 otherwise. All the variables apart from D_t are taken in their natural logarithms. αj captures the time-invariant unobserved stock specific fixed effects. AR(1) is the first order Lagrange Multiplier test performed on the first difference of the residuals because of the transformations involved. Sargan test follow a Chi-squared distribution with r degree of freedom under the null hypothesis of valid instruments. NORM(2) is the p-value for the Jaque-Bera normality test. The endogenous explanatory variables (all variables apart fromD_t) in the panel are GMM instrumented setting z≥1. [.] are p value and (.) are t statistics.

Coefficient	Variables	Quote Bid-ask spreads	Relative Bid-ask spreads	Effective Bid-ask spreads
Constantα_j	Ai	-4.82***	-4.82***	-5.73***
β1	Dt	0.59***	0.59***	0.74***
β2	lnVolume	-0.09***	-0.09***	0.03***
β3	lnVolume*Dt	-0.05***	-0.05***	-0.07***
β4	LnPrice	0.51***	-0.49***	0.47***
β5	LnPrice*Dt	0.045	0.045	0.018
β6	Moving StDev	3.10***	3.11***	6.70***
α_j		[0.00]	[0.00]	[0.00]
AR(1)		[0.00]	[0.00]	[0.00]
J statistic		15.9	15.9	11.98
Sargan test		0.42	0.42	0.33
NORM(2)		0.00	0.00	0.00
Adjusted R^2		0.35	0.35	0.13

* Significant at 10% level
** Significant at 5% level
*** Significant at 1% level

that bid-ask spreads increases by 0.03% when trading volume increases by 1%. Finally the interaction term *β3* is significant showing that the decrease in bid-ask spreads due to a 1% trading volume change is 0.05%, 0,05% and 0.07% in quote spread model, relative spread model, and effective spread model respectively due to the long term impact of the earnings announcements. Finally, the interaction term *β5* is statistically insignificant in three spread models showing that the change due to event (associated with intercept dummy) is constant effect.

β4 and *β6* are significant for three measures of bid-ask spread, which shows that stock liquidity is explained by the price and price volatility.

The Sargan test rejects null hypothesis of over-identifying instrumental variables shows the appropriateness of the instrumental variables. The R^2 indicates that 35% of the variation in the liquidity is explained by the quoted spread model; 35% is explained by the relative spread model, and 13% is explained by an effective spread model.

However, the panel does not pass the normality test and the test of the first order residual serial correlation, propose a non-linear relationship between variables. The test for normality also does not pass, thus proposes outliers in the data set.

5.2.2.3. S&P 100.

The constant αi for the S&P100 is significant in all the three bid-ask spreads, meaning that the differences in the initial levels of liquidity of the stocks are captured by GMM estimators.

After controlling for the impact of trading volume, share prices and volatility, in the three measures of spread model, the significance of intercept dummy coefficient *β1* shows that the quoted bid-ask spreads increased (liquidity decrease) on an average by 0.09% in quoted and relative spread model and 0.35 in effective spread model after earnings announcements. *β2* indicates that bid-ask spreads decreased (liquidity increase) 0.09%, 0,09%, and 0.40% in quote, relative and effective spread models respectively when trading volume increases by 1%. Finally the interaction term *β3* is significant in all of the three spread models showing that the decrease in bid-ask spreads (increase in liquidity) due to 1% trading volume change are 0.01%, 0.01%, and 0.26% for quoted, relative, and effective spread model respectively due to the

Table 5.2.2.3. S&P 100. Multi variate analysis of the long term impact of earnings announcement on stock market liquidity

The sample consists of 100 S&P100 firms that have data available for 181 days around earnings announcement date in the financial year 2006-2007. A log linear panel fixed effects regression model estimated with the use of Arellano and Bond (1991) GMM estimator is used. The panel is used to determine whether the average market liquidity of the stock change after earnings announcement after controlling for stock prices, trading volume and volatility of stock returns. In addition, β_3 and β_5 test if the slope coefficients on trading volume and price have changed following the earnings announcement. The model has following specification:

$$Illiqidity_{it} = \alpha_i + \beta_1 D_t + \beta_2 \ln Volume_{it} + \beta_3(\ln Volume_{it} * D_t) + \\ + \beta_4 \ln Price_{it} + \beta_5(\ln Price_{it} * D_t) + \beta_6 Stdev_{it} + \varepsilon_{it}$$

For j=1,2 ….90 and t=1, 2; where t=1 corresponds to the pre-earnings announcement of 99 firms on the FTSE 100, [0,-90], and t=2 corresponds to the post earnings announcement of 99 firms on the FTSE 100, [0,+90]. The dependant variable $Illiquidity_{it}$ correspondent to either quoted, relative or effective bid ask spread for stock j at time period t. Quoted spread is defined as the difference between the ask price and the bid price. Relative bid ask spread is defined as the ask price minus the bid price divided by the quoted mid-price. Effective bid ask spread is defined as twice as much as the absolute value of the difference between the transaction price and the mid price in effect at the time of the trade. $Volume_{it}$, $Price_{it}$, and $Stdeve_{it}$ represent the traded volume in money, closing price and return volatility for stock j at time t. The dummy variable D_t is equal to 1 in the post earnings announcement period, and is equal to 0 otherwise. All the variables apart from D_t are taken in their natural logarithms. αj captures the time-invariant unobserved stock specific fixed effects. AR(1) is the first order Lagrange Multiplier test performed on the first difference of the residuals because of the transformations involved. Sargan test follow a Chi-squared distribution with r degree of freedom under the null hypothesis of valid instruments. NORM(2) is the p-value for the Jaque-Bera normality test. The endogenous explanatory variables (all variables apart from D_t) in the panel are GMM instrumented setting z≥1. [.] are p value and (.) are t statistics.

Coefficient	Variables	Quote Bid-ask spreads	Relative Bid-ask spreads	Effective Bid-ask spreads
Constantα_j	Ai	-4.75***	-4.75***	-11.96***
β1	Dt	0.09***	0.09***	0.35***
β2	lnVolume	-0.09***	-0.09***	-0.40***
β3	lnVolume*Dt	-0.01	-0.01	-0.26***
β4	LnPrice	0.63***	-0.37***	0.65***
β5	LnPrice*Dt	0.055	0.055	-0.006
β6	Moving StDev	-1.74	-1.74	10.92**
α_j		[0.00]	[0.00]	0.04***
AR(1)		[0.00]	[0.00]	[0.00]
J statistic		44	44	41
Sargan test		0.31	0.31	0.49
NORM(2)		0.00	0.00	0.00
Adjusted R2		0.27	0.14	0.04

* Significant at 10% level
** Significant at 5% level
*** Significant at 1% level

impact of earnings announcements. The interaction term *β5* is statistically insignificant in three spread models showing that the change due to event (associated with intercept dummy) is single effect.

β4 and *β6* are significant for three measures of bid-ask spread, which shows that stock liquidity is explained by the price and price volatility.

The Sargan test is insignificant, shows the appropriateness of instrumental variables. The R^2 indicates that 27% of the variation in the liquidity is explained by the quote model; 14% of the variation in the liquidity is explained by relative spread model and 4% by effective spread model.

However, the panel does not pass the normality test and the test of the first order residual serial correlation, propose a non-linear relationship between variables.

5.2.3. Euronext Paris

5.2.3.1. CAC40.

The constant αi for the FTSE Small Cap is significant in all the three bid-ask spreads models, which means that the differences in the initial levels of liquidity of the stocks are captured by GMM estimators.

After controlling for the impact of trading volume, share prices and volatility, in the three measures of spread models, the significance of *β1* shows that the bid-ask spreads increase (liquidity decrease) on average by 1.67% after earnings announcements in quoted spread model, 1.67% in relative model, and 2.55% in effective spread model. *β2* indicates that bid-ask spreads decrease (liquidity decrease) by 0.17%% associated to 1% trading volume increase in quoted and relative spread models, and 15% in the effective spread model. Finally the interaction term *β3* is significant, showing that the decrease in bid-ask spreads due to 1% trading volume change are 0.18%, 0.18%, and 0.25% in the quoted, relative and effective spread models respectively due to the impact of earnings announcements. The interaction term *β5* is statistically insignificant in three spread models showing that the change due to event (associated with intercept dummy) is single effect. *β4* and *β6* are significant for three measures of bid-ask spread, which shows that stock liquidity is explained by the price and price volatility.

Table 5.2.3.1. CAC40. Multi variate analysis of the long-term impact of earnings announcement on stock market liquidity

The sample consists of 40 CAC40 firms that have data available for 181 days around earnings announcement date in the financial year 2006-2007. A log linear panel fixed effects regression model estimated with the use of Arellano and Bond (1991) GMM estimator is used. The panel is used to determine whether the average market liquidity of the stock change after earnings announcement after controlling for stock prices, trading volume and volatility of stock returns. In addition, β_3 and β_5 test if the slope coefficients on trading volume and price have changed following earnings announcement. The model has following specification:

$$Illiqidity_{it} = \alpha_i + \beta_1 D_t + \beta_2 \ln Volume_{it} + \beta_3 (\ln Volume_{it} * D_t) + \\ + \beta_4 \ln Price_{it} + \beta_5 (\ln Price_{it} * D_t) + \beta_6 Stdev_{it} + \varepsilon_{it}$$

For j=1,2 ….90 and t=1, 2; where t=1 corresponds to the pre-earnings announcement of 99 firms on the FTSE 100, [0,-90], and t=2 corresponds to the post earnings announcement of 99 firms on the FTSE 100, [0,+90]. The dependant variable $Illiquidity_{it}$ corresponds to either quoted, relative or effective bid ask spread for stock j at time period t. Quoted spread is defined as the difference between the ask price and the bid price. Relative bid ask spread is defined as the ask price minus the bid price divided by the quoted mid-price. Effective bid ask spread is defined as twice as much as the absolute value of the difference between the transaction price and the mid price in effect at the time of the trade. $Volume_{it}$, $Price_{it}$, and $Stdeve_{it}$ represent the traded volume in money, closing price and return volatility for stock j at time t. The dummy variable D_t is equal to 1 in the post earnings announcement period, and is equal to 0 otherwise. All the variables apart from D_t are taken in form of natural logarithms. αj captures the time-invariant unobserved stock specific fixed effects. AR(1) is the first order Lagrange Multiplier test performed on the first difference of the residuals because of the transformations involves. Sargan test follow a Chi-squared distribution with r degree of freedom under the null hypothesis of valid instruments. NORM(2) is the p-value for the Jaque-Bera normality test. The endogenous explanatory variables (all variables apart from D_t) in the panel are GMM instrumented setting z≥1. [.] are p value and (.) are t statistics.

Coefficient	Variables	Quote Bid-ask spreads	Relative Bid-ask spreads	Effective Bid-ask spreads
Constantα_j	Ai	-4.76***	-4.76***	-5.36***
β1	Dt	1.67***	1.67***	2.55***
β2	lnVolume	-0.17***	-0.17***	-0.15***
β3	lnVolume*Dt	-0.18***	-0.18***	-0.25***
β4	LnPrice	0.84***	-0.16***	0.91***
β5	LnPrice*Dt	-0.52	-0.52	-0.44
β6	Moving StDev	7.37**	7.38**	-1.51
α_j		[0.00]	0.282366	[0.00]
AR(1)		[0.00]	[0.00]	[0.00]
J statistic		36	36	11
Sargan test		0.19	0.21	0.33
NORM(2)		0.00	0.00	0.00
Adjusted R2		0.48	0.26	0.06

* Significant at 10% level
** Significant at 5% level
*** Significant at 1% level

The Sargan is insignificant, rejects the possibility of over identifying instrument variables. The R^2 indicates that 48% of the variation in stock liquidity is explained by the quoted spread model, 26% of the variation in stock liquidity is explained by the relative spread model and only 6% of the variation in stock liquidity is explained by the effective spread model. The panel does not pass the normality test and the test of the first order residual serial correlation, propose a non-linear relationship between variables and outlier in data set.

5.3. Summary

From the findings we observed that in the long term there are two sided impacts of earnings announcement on stock liquidity /bid ask spread. Earnings announcements increase bid ask spread (decrease stock liquidity) as we observe from a significant positive intercept dummy variable coefficient $\beta 1$. Meanwhile the trading volume increases due to earnings announcement leading to the decrease in the bid ask spread (or improvement in stock liquidity) as we observe from significant negative $\beta 3$. The overall effect will be the total of both the above effects. This finding holds true in both a univariate and multivariate analysis, and this also explaines the results in the univariate analysis, particularly the results from information cost liquidity hypothesis application. In the short term, stock liquidity decreases (bid ask increases) due to immediate impacts of earnings announcement. Due to the increase in trading volume after earnings announcement, stock liquidity gradually increases (bid ask spread decrease) by time. This helps to explain both situations in common law countries such as the US and the UK, where the information asymmetry cost component dominates bid ask spread and in code law country such as France, where the cost of trading (inventory holding and order processing cost components) dominates bid ask spread.

CHAPTER VI

STOCK LIQUIDITY AND POST EARNINGS ANNOUNCEMENT DRIFT: IMPLICATIONS OF BID ASK SPREAD AND INFORMATION ASYMMETRY COMPONENT

This chapter aims to investigate the source of the change in stock liquidity associated with post earnings announcement drift. It will examine the effects of total bid ask spread and particularly the information asymmetry cost component on the post earnings announcements drifts to work out the influence of news seperately. The use of Huang and Stoll (1997) bid ask spread decomposition model[42] allows me to draw the information asymmetry components in bid ask spread and move a step further to use this information asymmetry component as an explanatory variable to explain the variation in Post Earnings Announcement Drifts. Empirical analysis in the begining part of this chapter shows that in most cases there are strong evidences of relationship between stock liquidity and PEAD. More importantly, the results from the latter part of the chapter show that information asymmetry cost component can explain the change in post earnings announcements drifts in most indices over the two countries the UK and France. However, there is very weak evidence that information asymmetry accounts for the market response in the US. This might be due to the measurement of earnings surprise on the event day in the US markets.

6.1 Introduction

As discussed in the literature chapter, PEAD is an empirical finding that earnings drift in the direction of the earnings surprises following earnings announcement. The phenomenon is documented by Ball and Brown (1968), Foster, Olsen, Shevlin (1984), Bernard and Thomas (1989, 1990) etc ... There are also many researchers that have been trying to explain the reason for PEAD. The causes of PEAD could be categorized

[42] Van Ness et al (2001) conclude that any kind of decomposition model provides similar results.

into under reaction explanation (by investors, by analysts, and by bias information process by whoever is involved in the process) and misspecification explanation (which includes misspecification of market risk –beta, and trading risk). So far bid ask spread has not been used or used properly to provide an explanation for the existence of the PEAD. The only two papers that directly used bid ask spread in explaining the cause of PEAD is Ng et al (2008) and Chordia et al (2009), however, both of these papers use bid ask spread or bid ask spread plus a commission rate as a direct measure of transaction cost instead of stock market liquidity. This thesis uses Ng. et al (2008) approach, however it uses bid ask spread as a direct measure of stock liquidity and it involves three measures of bid ask spread, which are: quoted spread, relative spread and effective spread; this thesis also uses different measures of market response, earnings surprise and stock volatility. The unique contribution of this research is that it analyses in particular how the information asymmetry cost component influence the PEAD.

My results show that the stock market liquidity can provide a partial explanation for the persistence of PEAD. In the latter part, information asymmetry cost component which is inferred by using model by Huang and Stoll (1997) show significant effects on PEAD for indices from the UK and French markets, but not for the US.

The remaining of the chapter is organized as follow. The next section describes the implication of stock market liquidity on which the market reflects the information in earnings announcement. Section 6.3 decomposes bid ask spread using Huang and Stoll (1997) decomposition model, to infer the information asymmetry cost component of bid ask spread. Section 6.4 presents the research design and the outcome of the tests in which it describes the implication of the specific information asymmetry cost component on which the market reflects earnings information.

6.2. Effect of stock market liquidity on earnings announcements drifts

Following Ng et al (2008) approach, this section describes how changes in stock market liquidity can result in the behaviour of stock price after earnings information.

This chapter used the same data sample as for the whole thesis, which includes 99 companies from FTSE100; 233 companies from FTSE 250, 310 companies form FTSE Small cap and 912 companies from FTSE AIM All Shares; 30 companies form

DJIA, 96 companies form NASDAQ100, and 100 companies form S&P100 in American Stock Exchanges; and 40 companies from CAC 40 in the Paris Bourse.

6.2.1 Variables

6.2.1.1. Measurement of earning surprise.

As discussed in Chapter II, there are mainly three measures of earnings surprises employed in the literatures, which are earning-based, analyst-forecast based and price-based measures. This study use daily abnormal returns as a measure of earning surprises due to the reason that daily return will immediately capture the change in price after the news is released.

$$UE_{i,t} = AR_{i,t} = \frac{P_{i,t} - P_{i,t-1}}{P_{i,t-1}} - \frac{PI_t - PI_{t-1}}{PI_{t-1}} \qquad (6.2.1.1)$$

Where,

$UE_{i,t}$ is earnings surprise or abnormal stock return $AR_{i,t}$, calculated as the difference between single stock return on day t and market stock return on day t.

$P_{i,t}$ is stock price at time t

$P_{i,t-1}$ is stock price at time t-1

PI_t is stock index price at time t

PI_{t-1} is stock index price at time t-1.

Earnings surprises at event date will be:

$$UE_{i,0} = AR_{i,0} = \frac{P_{i,0} - P_{i,-1}}{P_{i,-1}} - \frac{PI_0 - PI_{-1}}{PI_{-1}} \qquad (6.2.1.2)$$

For the indices that abnormal returns reach its peak on the day 1, the earnings surprises at event date is replaced by[43]:

$$UE_{i,1} = AR_{i,1} = \frac{P_{i,1} - P_{i,-0}}{P_{i,0}} - \frac{PI_1 - PI_0}{PI_0} \qquad (6.2.1.3)$$

[43] In the US markets, many firms announce the final results after the market close on the earnings announcement date. This leads to the fact that strongest reaction to occur at the end of the day 1 as shown in DJIA, (table 4.1.2.5) NASDAQ (table 4.1.2.6) and S&P 100 (4.1.2.7). Meanwhile in London Stock Exchange, the news is released in the morning of the announcement date and the strongest reaction occurs at the end of event date 0.

6.2.1.2. Measures of stock market liquidity

As mentioned in earlier chapter, I use the three measures of bid ask spread including quote bid ask spread, relative bid ask spread and effective bid ask spread as direct measures of stock market liquidity.

Daily trades and quotes from DATASTREAM Advance database are used to calculate relative bid ask spread and effective bid ask spread.

$$QuoteSpread = BidPrice - AskPrice \qquad (6.2.1.4)$$

The relative bid ask spread is calculated as the difference between bid price and ask price divided by the mid price.

$$Relative\ Spread = \frac{PA - PB}{\frac{PA + PB}{2}} \qquad (6.2.1.5)$$

The effective bid ask spread is calculated as twice as much as absolute value of the difference between trading price and the mid price.

$$Effective\ Spread = 2\left|P - \frac{PA + PB}{2}\right| \qquad (6.2.1.6)$$

As noted in Gregoriou [2008] and many others it is necessary to use more than one measure of bid ask spread for several reasons. First of all, large trades are more likely to be executed outside the quoted spreads, which make quoted spread and relative spread not accurate measures. In addition, relative spread and effective spread take into account the mid-price but ignore price movement. In fact, price movement leading to mid-price change and the relative and effective spread also change. For this reason it is necessary to take into account the quoted spread in the analysis as well.

6.2.1.3. Other variables

Stock volatility is proxied by the standard deviation of stock returns during the pre earnings announcement period from day -90 to day -21.

My data sample set includes 8 separate indices. The empirical work has been done for each index separately. As firm specific risk can be well diversified and driven away within each market index, we gather that there is no crossectional variation in other firm specific variables such as firm beta, size, and book-to-market value. Therefore these variables are not necessarily added in each regression separately.

6.2.2 Model specification

This part of the research describes the model being used to examine the impact of stock illiquidity on the post earnings announcement drift. A panel estimated general least square regression model in which the explanatory variables are associated with event time was employed. Ng et al (2008) reported a significant relationship between price response with stock volatility, transaction cost and earnings surprises. This research uses the model that has following characteristics where the regression parameters represent elasticities of the change in independent variables and market response

$$Market\ response = CAR_{0,k}^{i}$$
$$= \beta_0 + \beta_1 UE_{i,0} + \beta_2\ UE_{i,0} Illiquidity_{i,0} + \beta_3 UE_{i,0} Volatility_{-90,-21}^{i} + \varepsilon_i \qquad (6.2.2.1)$$

Where,

Market response is calculated as cumulative daily abnormal return for stock i after earnings announcement up to an interval of k day, k=10, 20, 30,60,90, included event day.

$UE_{i,0}$, is earnings surprise at event date, i.e. daily abnormal returns on the event date, as defined in the above part.

Illiquidity is either closing quote, relative or effective bid ask spread.

Volatility is standard deviation of stock returns between day -90 and day -21[44].

Though sharing the same approach, there are main differences from this model and Ng et al (2008). (i) In this model, the dependent variable to represent price reaction after earnings announcement is cumulative abnormal returns in a specific period after earnings announcement. (ii) Illiquidity is proxied by either quote, relative or effective bid ask spread. (iii) The commission will be excluded in representing the stock illiquidity. (iv)Volatility is the standard deviation of stock returns from day -90 to day -21, which captures the stock volatility of stock before earnings announcement. Finally, (v) the regression is performed for each index separately, the variation of some firm specific variables such as firm beta, firm size, book-to-market value, investor sophistication etc are assumed to be constant within one index, thus it is not

[44] 70 day pre earnings announcement.

necessary to include them in the regression. As mentioned earlier firm specific risk can be well diversified and driven away within each market index, we assume that there is no crossectional variation in other variables such as firm size, and book-to-market value, so these variables are not necessarily added in each regression separately.

In this regression we mainly concern with β_1 and β_2, the main effect of earnings surprise and the interaction term between stock liquidity and earnings surprise.

6.2.3. Results and explanations

The regression outputs of panel estimated general least squared method are presented in table 6.2.3.1 to 6.2.3.8. The regression is performed in different event window length, k=10, 20, 30, 60 and 90. CAR is cumulated between earnings announcement date and k days after the announcement. By varying and lengthening the return window, the result will capture more change in abnormal returns or price reaction.

Overall all, the results are consistent with the hypothesis that firms with lower level of liquidity (higher level of illiquidity/bid-ask spread) will have larger level of market response, in other words, illiquidity has a positive earnings response coefficient. The reason being transaction cost prevents informed traders from acquiring price adjustment to earnings news.

6.2.3.1 FTSE100.

As expected, the results from table 6.2.3.1 show that the coefficients on the earnings surprise main effect are strong and significant and gradually decreases when news cease for FTSE100. The coefficients of surprise for k=10, 20, 30, 60, 90 for quote model are 0.727, 0.658, 0.454, 0.210, 0.076 respectively; for relative model are 0.679, 0.600, 0.407,0.102, 0.017 respectively; for effective model are 0.788, 0.737, 0.499, 0.235, and 0.089 respectively.

The interactions between earnings surprise and stock liquidity are also positive and highly significant over different windows of time. The coefficients for k=10, 20, 30, 60, 90 for quote model are 0.044, 0.047, 0.022, 0.049, 0.076 respectively; for relative model are 63.61, 82.59, 64.96, 64.57, 96.25 respectively; for effective model are 0.788, 0.737, 0.499, 0.235, and 0.089 respectively. It can be said that earnings surprise response coefficients are higher for the low liquidity stock. This result is very strong due to the level of confidence that is higher than 99%.

The interaction term between surprise and stock volatility in FTSE100 results also states that, stocks that have higher volatility will have higher degree of reaction.

6.2.3.2 FTSE250.

As expected, PEAD does exist in table 6.2.3.2, shown by the fact that the coefficients on the earnings surprise main effects are strong and highly significant for FTSE250. The coefficients of surprise for k=10, 20, 30, 60, 90 for quote model are 1.074, 1.323, 1.218, 1.080, 0.866 respectively; for relative model are 1.111, 1.371, 1.238; 1.131, 0.914 respectively; for effective model are 1.130, 1.216, 1.280, 1.163, and 0.931 respectively.

In the case of FTSE 250, the interactions between earnings surprise and stock liquidity are also positive and mostly significant over different windows of event time. The coefficients for k=10, 20, 30, 60, 90 for quote model are 0.007, 0.012, 0.008, 0.013, 0.014 respectively and highly signifiant; for relative model are 1.411, 4.579, 0.572, 4.952, 6.417 respectively, of which four numbers are significant; for effective model are 0.0004, 0.004, 0.002, 0.010, and 0.018 respectively, of which most are positive and significant. It is can be said that earnings surprise response coefficients are higher for the low liquidity stocks. These results are very strong due to the level of confidence which is higher than 99%.

The interaction term between surprise and stock volatility in the FTSE 250 results has negative sign and is significant, states that, stocks that have higher volatility will have higher degree of reaction.

6.2.3.3. FTSE Small Cap.

The coefficients on the earnings surprise main effect are strong and highly significant for the FTSE Small Cap. The coefficients of surprise for k=10, 20, 30, 60, 90 for quote model are 1.191, 1.305, 1.287, 1.428, 1.483 respectively; for relative model are 1.123, 1.237, 1.151; 1.114, 1.063 respectively; for effective model are 1.220, 1.346, 1.336, 1.445, and 1.488 respectively.

In the case of FTSE Small Cap, the interaction between earnings surprise and stock liquidity is positive and highly significant over different windows of time in relative spread model, but negative in quote spread and effective spread models. However, it is still saying that stock market liquidity plays a role in explaining the variation in

PEAD. The difference of sign (positive and negative) could be due to the sign of trade (buy or sell).

The interaction term between surprise and stock volatility in FTSE Small Cap results has negative sign and is significant, states that, stocks that have higher volatility will have higher reaction degree

6.2.3.4. FTSE AIM All Shares.

The coefficients on the earnings surprise main effect are strong and highly significant for FTSE AIM All Shares. The coefficients of surprise for k=10, 20, 30,60, 90 for quote model are 1.225, 1.291, 1.351, 1.462, 1.498 respectively; for relative model are 1.288, 1.423, 1.506; 1.615, 1.633 respectively; for effective model are 1.226, 1.297, 1.366, 1.498, and 1.523 respectively.

In the case of the FTSE AIM All Shares, the interaction term between earnings surprise and stock liquidity is also positive and highly significant over different window of time for quote spread model. For relative model the coefficient is negative and significant in all windows of event time. For effective spread model, the interaction term is negative over a 10day window length, but positive and significant in other window lengths 20 days, 30 days, 60 days and 90 days after earnings announcement. Similar as above, it can be said that stock market liquidity while interacting with earning surprise, it plays a role in explaining the market response.

The interaction term between surprise and stock volatility in the FTSEAIM All Shares results has negative sign and is significant, states that, stocks that have higher volatility will have a higher degree of reaction.

6.2.3.5. DJIA.

The coefficients on the earnings surprise main effect are strong and highly significant for DJIA in 10 days, 20 days and 30 days windows. The coefficients of surprise for k=10, 20, 30, for quote model are 1.967, 1.962, 1.369 respectively; in 60days and 90 days time periods, the surprise main effects are negative, and insignificant. For relative model the coefficients of the main surprise effect are positive, 2.024, 1.979, and 1.332 for 10 day, 20 day and 30 day time periods respectively; and negative in 60days and 90 days time period. For effective model, the coefficients of the main surprise effect are 2.159, 2.131 and highly significant in 10 and 20 day event window periods. After that the main surprise effects are insignificant.

The interaction terms between earnings surprise and stock liquidity are different in different time periods for the different spread models, however mainly significant. Over a 10 day period, the interaction term is insignificant in quote and relative spread model, but negative and highly significant in effective model. Over a 20 day period, the interaction terms are negative and highly significant for all of the three bid ask spread models. Over a 30 day period, the interaction terms are negative and highly significant for quote and relative spread models but are not significant in effective spread model. The interaction terms are also different in a 60 and 90 days time frame.

The interaction terms between surprise and stock volatility in DJIA results have a negative sign and are significant over a 10, 20 and 30 day periods, but have a positive effect in a 60 and 90 days time frame.

6.2.3.6. NASDAQ100.

The coefficients on the earnings surprise main effect are strong and highly significant for the NASDAQ100. The coefficients of surprise for k=10, 20, 30, 60, 90 for quote model are 1.007, 1.248, 1.253, 1.073, 0.248 respectively; for relative model are 0.927, 1.128, 1.182; 0.976, 0.296 respectively; for effective model are 0.922, 1.134, 1.177, 0.953, and 0.567 respectively.

In the case of the NASDAQ100, the interactions between earnings surprise and stock liquidity are different over the different event time frames in term of sign, however, mainly significant. For example, over a 10 day period, the interaction term is negative and highly significant in quote spread and relative spread model, but insignificant in effective spread model. Over a 90 day period the interaction terms are significantly negative in the quote spread and effective spread models but significantly positive in relative spread model. It can be said that stock market liquidity plays a role in the way market response to earnings announcement. The change of sign could be due to the sign of trade, i.e. buy or sell.

The interaction term between surprise and stock volatility in NASDAQ100 are positive and highly significant over a 10, 60 and 90 day period of time. In other event window lengths, these interactions terms are not significant.

6.2.3.7. S&P100.

The coefficients on the earnings surprise main effect are strong and highly significant for the S&P100. The coefficients of surprise are positive and highly significant for k=10, 20, 30,60, for all of three bid ask spread models, but insignificant over a 90 period.

Almost similar to the cases of the NASDAQ100 and DJIA, is the interaction terms between earnings surprise and stock liquidity are negative and significant at the beginning over a 10, 20, 30 days time frames. Lately, in the 60 and 90 day periods the sign of interaction term changes to positive. The sign change could be due to the sign of trade; however, there is evidence that stock market response has a relationship with stock market liquidity.

The interaction term between surprise and stock volatility in S&P 100 results has a positive sign in all event window lengths for all three spread models, states that stocks that have higher volatility will have a higher degree of reaction.

6.2.3.8. CAC40.

The coefficients on the earnings surprise main effect are mainly strong and highly significant for the CAC40. Over a 10 day time frame, the coefficients are positive and significant for all the three bid ask spread models. Over a 20 day period, the surprise coefficients are positive and significant for effective spread model and insignificant for relative and quote model. All other time frames except for the 90 day period for effective model, surprise coefficients are positive and significant.

The interaction between earnings surprise and stock liquidity are not significant in 10 day event period for quote and relative spread model, but negative significant in effective spread. In general the interaction terms are different for each event window length and each spread model but there are more evidence of a relation between stock market liquidity and market respone.

The interaction term between surprise and stock volatility in the CAC40 results has a positive sign in all time periods, for all three spread models, and state that stocks that have higher volatility will have a higher degree of reaction.

Table 6.2.3.1: FTSE100- Market reaction to earnings surprises[45]

This table presents the results of earnings response coefficient regression to examine the market reaction to earnings news for different event window length for the FTSE 100 index. The dependent variable is cumulative abnormal return of each counter period [0,10]; [0,20]; [0,30]; [0,60]; [0,90] after earnings announcement. Surprise is earnings surprise measured as the unexpected earning on the event day $UE_{i,0}$ with the indices that have the abnormal returns and trading volume reach its peak on day 1, surprise will be earnings surprise measured as unexpected earnings on day 1, due to many companies releasing information at the market close, led to the largest reaction happening on day 1. All other variables are defined in 6.2.1.

Dependent variable	$CAR_{0,k}$														
Independent variables	(Earnings) Surprise = $UE_{i,0}$[46] Illiquidity = Either Quote Spread, Relative spread or Effective Spread Volatility														
Number of cumulated day	k=10days			k=20days			k=30days			k=60days			k=90days		
	QS	RS	ES	QS	RS	ES	QS	RS	ES	QS	RS	ES	QS	RS	ES
Intercept	0.001***	0.001*	0.001**	0.003***	0.002***	0.002***	0.004***	0.004***	0.004***	0.011***	0.011***	0.011***	0.016***	0.016***	0.015***
Surprise	0.727***	0.679***	0.788***	0.658***	0.600***	0.737***	0.454***	0.407***	0.499***	0.210***	0.102**	0.235***	0.076*	0.017	0.089**
Surprise*Illiquidity	0.044***	63.618***	0.062***	0.047***	82.593***	0.060***	0.022***	64.961***	0.051***	0.049***	64.573***	0.060***	0.076***	96.259***	0.082***
Surprise*Volatility	5.477*	3.372	0.420	10.025**	4.527	4.157	23.317***	17.423***	17.828***	36.608***	38.565***	36.039***	41.182***	39.141***	42.498***
R^2	.83	.84	.83	.73	.74	.71	.59	.61	.59	.46	.48	.47	.36	.38	.36
Number of observations[47]	1089	1089	1089	2079	2079	2079	3069	3069	3069	6039	6039	6039	9009	9009	9009

*, **, *** indicate two tailed statistical significance at the 10%, 5% and 1% levels, respectively.

[45] In this table, QS, RS, ES stand for Quoted Spread, Relative Spread, and Effective Spread
[46] Or $UE_{i,1}$ in some indices that provide the strongest reaction on day 1
[47] Number of observations including event day

Table 6.2.3.2: FTSE250- Market reaction to earnings surprises[48]

This table presents the results of earnings response coefficient regression to examine the market reaction to earnings news for different event window lengths for firms in the FTSE 250 index. The dependent variable is cumulative abnormal return of each counter period [0,10]; [0,20]; [0,30]; [0,60]; [0,90] after earnings announcement. Surprise is earnings surprise measured as unexpected earning on the event day $UE_{i,0}$ with the indices that have the abnormal returns and trading volume reach its peak on day 1, surprise will be earnings surprise measured as unexpected earnings on day 1, due to many companies releasing information at the market close, led to the largest reaction happening on day 1. All other variables are defined in 6.2.1.

Dependent variable	$CAR_{0,k}$														
Independent variables	*(Earnings) Surprise* $=UE_{i,0}$[49] *Illiquidity = Either Quote Spread, Relative spread or Effective Spread* *Volatility*														
Number of cumulated day	*k=10days*			*k=20days*			*k=30days*			*k=60days*			*k=90days*		
	QS	*RS*	*ES*	*QS*	*RS*	*ES*	*QS*	*RS*	*ES*	*QS*	*RS*	*ES*	*QS*	*RS*	*ES*
Intercept	0.007***	0.006***	0.006***	0.011***	0.011***	0.008***	0.008***	0.008***	0.008***	0.010***	0.009***	0.009***	0.011***	0.01***	0.010***
Surprise	1.074***	1.111***	1.130***	1.323***	1.371***	1.216***	1.218***	1.238***	1.280***	1.080***	1.131***	1.163***	0.866***	0.914***	0.931***
*Surprise*Illiquidity*	0.007***	1.411*	-0.0004	0.012***	4.597***	0.004***	0.008***	0.572	0.002	0.013***	4.952***	0.010***	0.014***	6.417***	0.018***
*Surprise*Volatility*	-8.980***	-10.110***	-9.797***	-23.964***	-26.101***	-14.934***	-16.617***	-15.538***	-18.001***	-14.331***	-15.588***	-16.515***	-4.774***	-7.001***	-7.303***
R^2	.73	.72	.72	.37	.37	.66	.60	.60	.59	.43	.42	.42	.30	.30	.29
Number of observations[50]	2563	2563	2563	4893	4893	4893	7233	7233	7233	14213	14213	14213	21203	21203	21203

*, **, *** indicate two tailed statistical significance at the 10%, 5% and 1% levels, respectively.

[48] In this table, QS, RS, ES stand for Quoted Spread, Relative Spread, and Effective Spread

[49] Or $UE_{i,1}$ in some indices that provide the strongest reaction on day 1

[50] Number of observations including event day

Table 6.2.3.3: FTSE Small Cap- Market reaction to earnings surprises[51]

This table presents the results of earnings response coefficient regression to examine the market reaction to earnings news for different event window lengths for firms in the FTSE Small Cap Index. The dependent variable is cumulative abnormal return of each counter period [0,10]; [0,20]; [0,30]; [0,60]; [0,90] after earnings announcement. Surprise is earnings surprise measured as unexpected earning on the event day $UE_{i,0}$ with the indices that have the abnormal returns and trading volume reach its peak on day 1, surprise will be earnings surprise measured as unexpected earnings on day 1, due to many companies releasing information at the market close, led to the largest reaction happening on day 1. All other variables are defined in 6.2.1.

Dependent variable	$CAR_{0,k}$														
Independent variables	*(Earnings) Surprise =* $UE_{i,0}$[52] *Illiquidity = Either Quote Spread, Relative spread or Effective Spread* *Volatility*														
Number of cumulated day	*k=10days*			*k=20days*			*k=30days*			*k=60days*			*k=90days*		
	QS	*RS*	*ES*	*QS*	*RS*	*ES*	*QS*	*RS*	*ES*	*QS*	*RS*	*ES*	*QS*	*RS*	*ES*
Intercept	*0.004****	*0.004****	*0.004****	*0.005****	*0.005***	*0.005****	*0.006****	*0.005****	*0.005****	*0.006****	*0.006****	*0.006****	*0.004****	*0.004****	*0.004****
Surprise	*1.191****	*1.123****	*1.220****	*1.305****	*1.237****	*1.346****	*1.287****	*1.151****	*1.336****	*1.428****	*1.114****	*1.455****	*1.483****	*1.063****	*1.488****
*Surprise*Illiquidity*	*-0.002****	*0.484***	*-0.005****	*-0.001****	*0.617****	*-0.005****	*-0.001****	*2.288****	*-0.005****	*0.0003*	*6.226****	*-0002****	*0.0004**	*7.630****	*0.0002*
*Surprise*Volatility*	*-4.287****	*-3.146****	*-4.893****	*-6.760****	*-5.807****	*-7.454***	*-5.293****	*-3.885****	*-6.113****	*-6.590****	*-4.115****	*-7.001****	*-8.915****	*-5.191****	*-8.991****
R^2	*.75*	*.74*	*.79*	*.64*	*.62*	*.65*	*.55*	*.54*	*.56*	*.46*	*.47*	*.46*	*.38*	*.39*	*.38*
Number of observations[53]	*3377*	*3377*	*3377*	*6447*	*6447*	*6447*	*9517*	*9517*	*9517*	*18727*	*18727*	*18727*	*27937*	*27937*	*27937*

*, **, *** indicate two tailed statistical significance at the 10%, 5% and 1% levels, respectively.

[51] In this table, QS, RS, ES stand for Quoted Spread, Relative Spread, and Effective Spread
[52] Or $UE_{i,1}$ in some indices that provide the strongest reaction on day 1
[53] Number of observations including event day

Table 6.2.3.4: FTSE AIM All Shares- Market reaction to earnings surprises[54]

This table presents the results of earnings response coefficient regression to examine the market reaction to earnings news for different event window lengths for firms in the FTSE AIM All Shares index. The dependent variable is cumulative abnormal return of each counter period [0,10]; [0,20]; [0,30]; [0,60]; [0,90] after earnings announcement. Surprise is earnings surprise measured as unexpected earning on the event day $UE_{i,0}$ with the indices that have the abnormal returns and trading volume reach its peak on day 1, surprise will be earnings surprise measured as unexpected earnings on day 1, due to many companies releasing information at the market close, led to the largest reaction happening on day 1. All other variables are defined in 6.2.1.

Dependent variable	$CAR_{0,k}$														
Independent variables	*(Earnings) Surprise =* $UE_{i,0}$[55] *Illiquidity = Either Quote Spread, Relative spread or Effective Spread* *Volatility*														
Number of cumulated day	*k=10days*			*k=20days*			*k=30days*			*k=60days*			*k=90days*		
	QS	*RS*	*ES*	*QS*	*RS*	*ES*	*QS*	*RS*	*ES*	*QS*	*RS*	*ES*	*QS*	*RS*	*ES*
Intercept	*0.001****	*0.001****	*0.001****	*0.003****	*0.002****	*0.003*	*0.005****	*0.004****	*0.005****	*0.011****	*0.010****	*0.011****	*0.0162****	*0.015****	*0.016****
Surprise	*1.225****	*1.288****	*1.226****	*1.291****	*1.423****	*1.297*	*1.351****	*1.506****	*1.366****	*1.462****	*1.615****	*1.498****	*1.498****	*1.633****	*1.523****
*Surprise*Illiquidity*	*0.0003***	*-0.665****	*-0.0001*	*0.002****	*-1.127****	*0.001*	*0.004****	*-1.133****	*0.003****	*0.008****	*-1.076****	*0.008****	*0.006****	*-0.944****	*0.007****
*Surprise*Volatility*	*-4.110****	*-3.088****	*-4.133****	*-5.172****	*-4.683****	*-5.198*	*-6.632****	*-6.352****	*-6.693****	*-8.930****	*-8.702****	*-9.211****	*-9.412****	*-8.933****	*-9.540****
R^2	*.86*	*.86*	*.86*	*.73*	*.72*	*.74*	*.68*	*.64*	*.67*	*.47*	*.47*	*.46*	*.38*	*.40*	*.47*
Number of observations[56]	*9922*	*9922*	*9922*	*18942*	*18942*	*18942*	*27962*	*27962*	*27962*	*55022*	*55022*	*55022*	*82082*	*82082*	*82082*

*, **, *** indicate two tailed statistical significance at the 10%, 5% and 1% levels, respectively.

[54] In this table, QS, RS, ES stand for Quoted Spread, Relative Spread, and Effective Spread
[55] Or $UE_{i,1}$ in some indices that provide the strongest reaction on day 1
[56] Number of observations including event day

Table 6.2.3.5: DJIA- Market reaction to earnings surprises[57]

This table presents the results of earnings response coefficient regression to examine the market reaction to earnings news for different time frames for firms in the DJIA index. The dependent variable is cumulative abnormal return of each counter period [0,10]; [0,20]; [0,30]; [0,60]; [0,90] after earnings announcement. Surprise is earnings surprise measured as unexpected earning on the event day $UE_{i,0}$ with the indices that have the abnormal returns and trading volume reach its peak on day 1, surprise will be earnings surprise measured as unexpected earnings on day 1, due to many companies releasing information at the market close, led to the largest reaction happening on day 1. All other variables are defined in 6.2.1.

Dependent variable	$CAR_{0,k}$														
Independent variables	*(Earnings) Surprise =$UE_{i,0}$*[58] *Illiquidity = Either Quote Spread, Relative spread or Effective Spread* *Volatility*														
Number of cumulated day	*k=10days*			*k=20days*			*k=30days*			*k=60days*			*k=90days*		
	QS	*RS*	*ES*	*QS*	*RS*	*ES*	*QS*	*RS*	*ES*	*QS*	*RS*	*ES*	*QS*	*RS*	*ES*
Intercept	*-0.002****	*-0.002****	*-0.002****	*-0.002****	*-0.002****	*-0.003****	*-0.002****	*-0.001****	*-0.002*	*0.0004*	*0.001*	*-0.0003*	*0.005****	*0.005****	*0.005****
Surprise	*1.967****	*2.024****	*2.159****	*1.962****	*1.979****	*2.131****	*1.369****	*1.332****	*1.582*	*-0.062*	*-0.180*	*0.271*	*-0.695****	*-0.799****	*-0.284*
*Surprise*Illiquidity*	*-0.802*	*-68.340*	*-1.727***	*-1.713****	*-126.039****	*-2.760****	*-1.302****	*-88.428****	*-2.443*	*0.344*	*49.832**	*-0.695*	*1.356****	*113.746****	*0.250*
*Surprise*Volatility*	*-73.438****	*-76.758****	*-87.504****	*-68.556****	*-70.086****	*-83.502****	*-13.753*	*-11.098****	*-30.610*	*103.713****	*112.164****	*81.908****	*134.873****	*142.914****	*109.7****
R^2	*0.82*	*0.83*	*0.84*	*0.67*	*0.67*	*0.73*	*0.59*	*0.58*	*0.67*	*0.42*	*0.40*	*0.49*	*0.25*	*0.23*	*0.28*
Number of observations[59]	*330*	*330*	*330*	*630*	*630*	*630*	*930*	*930*	*930*	*1830*	*1830*	*1830*	*2730*	*2730*	*2730*

*, **, *** indicate two tailed statistical significance at the 10%, 5% and 1% levels, respectively.

[57] In this table, QS, RS, ES stand for Quoted Spread, Relative Spread, and Effective Spread
[58] Or $UE_{i,1}$ in some indices that provide the strongest reaction on day 1
[59] Number of observations including event day

Table 6.2.3.6: NASDAQ100- Market reaction to earnings surprises[60]

This table presents the results of earnings response coefficient regression to examine the market reaction to earnings news for different event window lengths for firms in the NASDAQ100 index. The dependent variable is cumulative abnormal return of each counter period [0,10]; [0,20]; [0,30]; [0,60]; [0,90] after earnings announcement. Surprise is earnings surprise measured as unexpected earning on the event day $UE_{i,0}$ with the indices that have the abnormal returns and trading volume reach its peak on day 1, surprise will be earnings surprise measured as unexpected earnings on day 1, due to many companies releasing information at the market close, led to the largest reaction happening on day 1. All other variables are defined in 6.2.1.

Dependent variable	$CAR_{0,k}$														
Independent variables	*(Earnings) Surprise =*$UE_{i,0}$[61] *Illiquidity = Either Quote Spread, Relative spread or Effective Spread* *Volatility*														
Number of cumulated day	*k=10days*			*k=20days*			*k=30days*			*k=60days*			*k=90days*		
	QS	*RS*	*ES*	*QS*	*RS*	*ES*	*QS*	*RS*	*ES*	*QS*	*RS*	*ES*	*QS*	*RS*	*ES*
Intercept	*0.002****	*0.001****	*0.002*	*-0.0004*	*-0.002***	*-0.002***	*-0.001****	*-0.003****	*-0.003****	*-0.005****	*-0.006****	*-0.007****	*-0.006****	*-0.008****	*-0.007****
Surprise	*1.007****	*0.927****	*2.00.922*	*1.248****	*1.128****	*1.134****	*1.253****	*1.182****	*1.177****	*1.073****	*0.976****	*0.953****	*0.248****	*0.296****	*0.567****
*Surprise*Illiquidity*	*-3.438****	*-109.907****	*0.785*	*-4.622****	*-57.712****	*0.498***	*5.131****	*-177.319****	*0.987****	*-6.667****	*-69.912***	*-2.897****	*-2.750****	*120.238****	*-3.854****
*Surprise*Volatility*	*8.937****	*10.859****	*5.219*	*-1.896*	*0.463*	*-3.718*	*0.38*	*-0.525*	*-8.392****	*10.663****	*9.479****	*25.296****	*46.010****	*36.981****	*47.402****
R^2	*0.85*	*0.83*	*0.84*	*0.71*	*0.68*	*0.68*	*0.66*	*0.59*	*0.61*	*0.45*	*0.44*	*0.48*	*0.25*	*0.27*	*0.31*
Number of observations[62]	*1056*	*1056*	*1056*	*2016*	*2016*	*2016*	*2796*	*2976*	*2976*	*5856*	*0.44*	*5856*	*8736*	*8736*	*8736*

*, **, *** indicate two tailed statistical significance at the 10%, 5% and 1% levels, respectively.

[60] In this table, QS, RS, ES stand for Quoted Spread, Relative Spread, and Effective Spread
[61] Or $UE_{i,1}$ in some indices that provide the strongest reaction on day 1
[62] Number of observations including event day

Table 6.2.3.7: S&P100- Market reaction to earnings surprises[63]

This table presents the results of earnings response coefficient regression to examine the market reaction to earnings news for different event time frames for firms in the S&P100 index. The dependent variable is cumulative abnormal return of each counter period [0,10]; [0,20]; [0,30]; [0,60]; [0,90] after earnings announcement. Surprise is earnings surprise measured as unexpected earning on the event day $UE_{i,0}$ with the indices that have the abnormal returns and trading volume reach its peak on day 1, surprise will be earnings surprise measured as unexpected earnings on day 1, due to many companies releasing information at the market close, led to the largest reaction happening on day 1. All other variables are defined in 6.2.1.

Dependent variable	$CAR_{0,k}$														
Independent variables	*(Earnings) Surprise* $=UE_{i,0}$[64] *Illiquidity = Either Quote Spread, Relative spread or Effective Spread* *Volatility*														
Number of cumulated day	*k=10days*			*k=20days*			*k=30days*			*k=60days*			*k=90days*		
	QS	*RS*	*ES*	*QS*	*RS*	*ES*	*QS*	*RS*	*ES*	*QS*	*RS*	*ES*	*QS*	*RS*	*ES*
Intercept	0.002***	0.003***	0.003***	0.005***	0.005***	0.005***	0.009***	0.009***	0.009***	0.013***	0.013***	0.013	0.016***	0.016***	0.016***
Surprise	0.837***	0.815***	0.827***	0.924***	0.889***	0.906***	0.797***	0.753***	0.781***	0.185***	0.175***	0.194	-0.077	-0.067	-0.073
*Surprise*Illiquidity*	-1.318***	-52.159***	-1.632***	-1.048***	-42.127***	-1.195***	-0.575***	-16.878**	-0.598***	1.777***	104.498***	2.398	1.552***	80.805***	2.264***
*Surprise*Volatility*	18.318***	17.750***	18.048***	8.715***	9.197***	8.742***	16.037***	17.298***	16.263***	44.850***	43.168***	43.772	58.539***	56.024***	57.304***
R^2	0.70	0.69	0.68	0.56	.55	0.55	.48	.48	.47	.37	.44	.41	.22	.21	.23
Number of observations[65]	1089	1089	1089	2079	2079	2079	3069	3069	3069	6039	6039	6039	9009	9009	9009

*, **, *** indicate two tailed statistical significance at the 10%, 5% and 1% levels, respectively.

[63] In this table, QS, RS, ES stand for Quoted Spread, Relative Spread, and Effective Spread

[64] Or $UE_{i,1}$ in some indices that provide the strongest reaction on day 1

[65] Number of observations including event day

Table 6.2.3.8: CAC40- Market reaction to earnings surprises[66]

This table presents the results of earnings response coefficient regression to examine the market reaction to earnings news for different event time frames or firms in the CAC40 index in the Euronext Paris. The dependent variable is cumulative abnormal return of each counter period [0,10]; [0,20]; [0,30]; [0,60]; [0,90] after earnings announcement. Surprise is earnings surprise measured as unexpected earning on the event day $UE_{i,0}$ with the indices that have the abnormal returns and trading volume reach its peak on day 1, surprise will be earnings surprise measured as unexpected earnings on day 1, due to many companies releasing information at the market close, led to the largest reaction happening on day 1. All other variables are defined in 6.2.1.

Dependent variable	$CAR_{0,k}$														
Independent variables	*(Earnings) Surprise =* $UE_{i,0}$[67] *Illiquidity = Either Quote Spread, Relative spread or Effective Spread* *Volatility*														
Number of cumulated day	*k=10days*			*k=20days*			*k=30days*			*k=60days*			*k=90days*		
	QS	*RS*	*ES*	*QS*	*RS*	*ES*	*QS*	*RS*	*ES*	*QS*	*RS*	*ES*	*QS*	*RS*	*ES*
Intercept	*0.002****	*0.002****	*0.002****	*0.005****	*0.005****	*0.006****	*0.005****	*0.006****	*0.006****	*0.007****	*0.006****	*0.007****	*0.005****	*0.005****	*0.005****
Surprise	*0.557****	*0.578****	*1.018****	*0.106*	*0.129*	*0.527****	*0.330****	*0.311****	*0.545****	*0.321****	*0.345****	*0.352****	*0.149**	*0.156**	*0.109*
*Surprise*Illiquidity*	*-2.101*	*28.790*	*-5.867****	*3.049****	*122.803****	*-3.874****	*4.157****	*170.204****	*-1.481**	*2.563****	*-326.485****	*0.791*	*0.229*	*-521.349****	*1.149**
*Surprise*Volatility*	*43.351****	*29.907****	*21.579***	*54.801****	*58.297****	*46.713****	*36.019****	*42.706****	*37.946****	*53.636****	*77.850****	*59.657****	*62.376****	*91.262****	*63.146****
R^2	*0.78*	*0.76*		*0.70*	*0.70*	*0.64*	*0.56*	*0.56*	*0.54*	*0.43*	*0.44*	*0.43*	*0.29*	*0.32*	*0.29*
Number of observations[68]	*440*	*440*	*440*	*840*	*840*	*840*	*1240*	*1240*	*1240*	*2440*	*2440*	*2440*	*3460*	*3460*	*3460*

*, **, *** indicate two tailed statistical significance at the 10%, 5% and 1% levels, respectively.

[66] In this table, QS, RS, ES stand for Quoted Spread, Relative Spread, and Effective Spread
[67] Or $UE_{i,1}$ in some indices that provide the strongest reaction on day 1
[68] Number of observations including event day

6.3. Does information asymmetry account for changes in post earnings announcements drifts?

6.3.1. Bid ask spread decomposition and Information asymmetry component

This part of the chapter VI aims at decomposing the bid ask spread into trading cost and information asymmetry components. As discussed previously in chapter II, it is usually considered that the spread helps to cover three different costs: The order processing cost, which includes any cost associated with order execution; the inventory holding cost, which includes any cost bearning the inventory risk; and finally the information asymmetry cost or adverse selection cost, which includes any cost bearning the risk of inferior information compared to other parties. Over the last several decades, there are two important models by Lin, Sanger and Booth (1995) and Huang and Stoll (1997) which have been largely used in empirical studies for various purposes.

Lin, Sanger and Booth (1995) model has the following characteristics:

$$\Delta log\left[M_{i,t}\right] = \varphi_i(log\left[PRICE_{i,t-1}\right] - log\left[M_{i,t-1}\right] + e_{i,t} \qquad (6.3.1.1)$$

Where,

$\Delta log\left[M_{i,t}\right]$ denotes a change from previous quote (prior to a transaction),

$M_{i,t}$ is the quoted spread midpoint at time t for firm i, and

$PRICE_{i,t-1}$ is the transaction price prior to the quoted spread at time t for firm i

$e_{i,t}$ is an error term.

According to Lin, Sanger and Booth (1995), coefficient φ_i is the estimates of the percentage of the effective spread attribute to informed trading for firm i. so firm i's adverse selection spread is φ_i times the firm's average effective spread.

The second popular model, Huang and Stoll (1997), partitions the total effective spread into informed trading, order processing and inventory holding cost components. The model has the following characteristics:

$$\Delta PRICE_{i,t} = \beta_{1i} Q_{it} + \beta_{2i} Q_{i,t-1} + \beta_3 Q_{A,t-1} + e_{i,t} \qquad (6.3.1.2)$$

In this model, Huang and Stoll (1997) denote

$\Delta \mathrm{PRICE}_{\mathrm{i,t}}$ for a change from the previous retained trade

Q_{it} equals 1 if the trade at time t was a sale, and equals -1 if the trade at time t was a buy. Trades at prices higher than the prevailing quote midpoint are defined as market maker sells ($Q_{it} = 1$) and trades at prices below the prevailing quote midpoint as market maker buys($Q_{it} = -1$) .

In this model, trades at mid point are excluded. The $Q_{A,t-1}$ is the aggregate indicator for buy and sell, which is equal to 1, -1, or 0 if the sum of $Q_{i,t-1}$ across all sample stocks is positive, negative or zero accordingly to capture market wide pressure on market makers inventory levels.

The estimate of $\beta_{1,i}$ is one half the estimated effective spread, and the estimated adverse selection component is equal to $2(\beta_{2,i}+\beta_{1,i})$.

$e_{i,t}$ is the error term.

Van Ness et al (2001) suggest that any kind of spread decomposition model provides similar results. In fact I had decomposed the bid ask spread by the above two models and the results proved the similars. In this study I present the outcomes based on the Huang and Stoll (1997) decomposition model, which directly infers the adverse information component. The results of decomposition are presented in the following table 6.3.1.1 to 6.3.1.3.

Table 6.3.1.1 presents that the information asymmetry component in bid ask spread decreases over time in the UK equity market for large stock index such as the FTSE100 and FTSE 250. In the FTSE 100, the information asymmetry components for time frames: k=10 , 20, 30, 60 and 90 days are 2.562, 2.554, 2.516, 1.768, 1.858, 1.554[69] respectively. In the FTSE 250, the information asymmetry component for time frames of: 10, 20, 30, 60, and 90 days are 1.012, 0.832, 0.790, 0.674, 0.678, 0.694 respectively . For the smaller indices like the FTSE Small Cap and FTSEAIM All Shares the information asymmetry component does not change much.

In the US equity market, table 6.3.1.2 shows that the information asymmetry component in bid ask spread also seems to decrease over time, however, it is not as clear as in the UK. Initially in a 10 day time frame, the information asymmetry components are not as large as they are in a 20 days period. After a 20 days period, the

[69] In percentage

information component decreased for all the three indices DJIA, NASDAQ100, and S&P100.

Table 6.3.1.1. Spread decomposition base on Huang and Stoll model – UK equity market

This table presents the results of coefficient regression from the Huang and Stoll (1997) model to decompose bid ask spread in different window period after earnings announcement for indices in the London Stock Exchange. The model has the following specification: $\Delta PRICE_{i,t} = \beta_{1i}Q_{it} + \beta_{2i}Q_{i,t-1} + \beta_3 Q_{A,t-1} + e_{i,t}$ Where the dependent variable $\Delta PRICE_{i,t}$ is the daily closing price change. Q_{it} equal 1 (-1) if the trade at time t was a sell (buy). Trades at price above the prevailing quote midpoint as market maker sells ($Q_{it} = 1$) and trades at prices below the prevailing quote midpoint as market maker buys ($Q_{it} = -1$) . In this model trades at mid point are excluded. The $Q_{A,t-1}$ is the aggregate indicator for buy and sell, which equal 1, -1, or 0 if the sum of $Q_{i,t-1}$ across all sample stocks is positive, negative or zero accordingly to capture market-wide pressure on market makers inventory levels. The estimate of $\beta_{1,}$ coefficient coefficient is one-half of the estimated effective spread. According to Huang and Stoll (1997), the estimated adverse selection component equal $2(\beta_1 + \beta_2)$. HS information asymmetry cost components are reported in percentage.

Period after earnings announcement	**10 days**	**20 days**	**30days**	**60days**	**90 days**	**(180 days)[70]**
FTSE100						
β_1	1.826***	1.661***	1.636***	1.328***	1.291***	1.008***
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
β_2	-0.545***	-0.384**	-0.378**	-0.444***	-0.362***	-0.231***
	[0.00]	[0.03]	[0.02]	[0.00]	[0.00]	[0.00]
HS information asymmetry component	2.562	2.554	2.516	1.768	1.858	1.554
Number of obs. (unbalanced panel)	851	1571	2233	4378	6536	13067
FTSE 250						
β_1	0.863***	0.807***	0.796***	0.697***	0.690***	0.662***
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
β_2	-0.357***	-0.391***	-0.401***	-0.360***	-0.351***	-0.315***
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
HS information asymmetry component	1.012	0.832	0.790	0.674	0.678	0.694
Number of obs. (unbalanced panel)	2230	4153	5907	11539	17461	34460
FSTE Small Cap						
β_1	0.417***	0.422***	0.383***	0.397***	0.346***	0.323***
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
β_2	-0.307***	-0.295***	-0.243***	-0.255***	-0.228***	-0.214***
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
HS information asymmetry component	0.220	0.252	0.280	0.284	0.236	0.218
Number of obs. (unbalanced panel)	2377	4455	6493	12799	19341	37129
FTSE AIM All Shares						
β_1	0.261***	0.206***	0.177***	0.107***	0.095***	0.050***
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
β_2	-0.260***	-0.180***	-0.171***	-0.105***	-0.094***	-0.050***
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
HS information asymmetry component	0.002	0.052	0.012	0.004	0.002	0.0004
Number of obs. (unbalanced panel)	1371	2745	4141	8483	12797	24414

*, **, *** indicate two tailed statistical significance at the 10%, 5% and 1% levels, respectively.

[70] 180 days includes 90 days before earnings announcement and 90 days after earnings announcement

Table 6.3.1.2. Spread decomposition base on Huang and Stoll model – US equity market

This table presents the results of coefficient regression from the Huang and Stoll (1997) model to decompose bid ask spread in different tine frames after earnings announcement for three indices DJIA, NASDAQ100 and S&P100 in the US equity markets. The model has following specification: $\Delta PRICE_{i,t} = \beta_{1i}Q_{it} + \beta_{2i}Q_{i,t-1} + \beta_3 Q_{A,t-1} + e_{i,t}$ Where, The dependent variable$\Delta PRICE_{i,t}$ is daily closing price change. Q_{it} equal 1 (-1) if the trade at time t was a sell (buy). Trades at the price above the prevailing quote midpoint as market maker sells ($Q_{it} = 1$) and trades at prices below the prevailing quote midpoint as market maker buys ($Q_{it} = -1$) . In this model, trades at the mid point are excluded. The $Q_{A,t-1}$ is the aggregate indicator for buy and sell, which equal 1, -1, or 0 if the sum of $Q_{i,t-1}$ across all sample stocks is positive, negative or zero accordingly to capture market-wide pressure on the market makers inventory levels. The estimate of $\beta_{1,}$ coefficient is one-half of the estimated effective spread. According to Huang and Stoll (1997), the estimated adverse selection component is equal $2(\beta_1 + \beta_2)$. HS information asymmetry cost components are reported in percentage.

Period after earnings announcement	10 days	20 days	30 days	60 days	90 days	(180 days)[71]
DJIA						
β_1	0.027	0.028	0.030	0.019	0.008	0.024***
	[0.30]	[0.21]	[0.16]	[0.18]	[0.51]	[0.00]
β_2	0.009	0.014	0.011	-0.003	-0.017*	-0.022***
	[0.49]	[0.31]	[0.49]	[0.81]	[0.07]	[0.00]
HS information asymmetry component	0.072	0.084	0.082	0.032	0.018	0.004
Number of obs. (unbalanced panel)	254	465	687	1338	2022	3760
NASDAQ 100						
β_1	0.062***	0.048***	0.050***	0.029***	0.026***	0.020***
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
β_2	-0.014*	0.004	0.003	0.004	-0.002	-0.004
	[0.08]	[0.56]	[0.61]	[0.36]	[0.54]	[0.24]
HS information asymmetry component	0.096	0.104	0.106	0.066	0.048	0.032
Number of obs. (unbalanced panel)	923	1574	2583	5110	7672	13899
S&P100						
β_1	0.035**	0.027**	0.038***	0.031***	0.028***	0.033***
	[0.02]	[0.02]	[0.00]	[0.00]	[0.00]	[0.00]
β_2	-0.006	0.006	0.009	-0.002	-0.015***	-0.022***
	[0.58]	[0.45]	[0.24]	[0.80]	[0.01]	[0.00]
HS information asymmetry component	0.058	0.066	0.094	0.058	0.026	0.022
Number of obs. (unbalanced panel)	866	1587	2348	4598	6966	12808

*, **, *** indicate two tailed statistical significance at the 10%, 5% and 1% levels, respectively.

In the French equity market the HS information asymmetry component also decreases over time. In a 10 , 20, 30 60 and 90 day window time frames, information asymmetry components are 0.118; 0.128; 0.064, 0.076, 0.052, 0.026 respectively . Overall we have also noticed that the information asymmetry component is quite small in the case of FTSE Small Cap, FTSE AIM All Shares, US market, and the CAC 40.

[71] 180 days includes 90 days before earnings announcement and 90 days after earnings announcement

Table 6.3.1.3. Spread decomposition base on Huang and Stoll model – French equity market

This table presents the results of coefficient regression from the Huang and Stoll (1997) model to decompose bid ask spread in different time frames after earnings announcement for the CAC40 in the Euronext Paris. The model has the following specification: $\Delta PRICE_{i,t} = \beta_{1i}Q_{it} + \beta_{2i}Q_{i,t-1} + \beta_3 Q_{A,t-1} + e_{i,t}$ Where the dependent variable$\Delta PRICE_{i,t}$ is the daily closing price change. Q_{it} equal 1 (-1) if the trade at time t was a sell (buy). Trades at price above the prevailing quote midpoint as market maker sells ($Q_{it} = 1$) and trades at prices below the prevailing quote midpoint as market maker buys ($Q_{it} = -1$) . In this model, trade at mid point are excluded. The $Q_{A,t-1}$ is the aggregate indicator for buy and sell, which is equal 1, -1, or 0 if the sum of $Q_{i,t-1}$ across all sample stocks is positive, negative or zero accordingly to captured market-wide pressure on market makers inventory levels. The estimate of $\beta_{1,}$ coefficient is one-half of the estimated effective spread. According to Huang and Stoll (1997), the estimated adverse selection component is equal $2(\beta_1 + \beta_2)$. HS information asymmetry cost components are reported in percentage.

Period after earnings announcement	10 days	20 days	30 days	60 days	90 days	(180 days)[72]
CAC 40						
β_1	0.094***	0.083***	0.069***	0.068***	0.058***	0.050***
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
β_2	-0.035*	-0.019	-0.037**	-0.030***	-0.032***	-0.024***
	[0.07]	[0.28]	[0.01]	[0.00]	[0.00]	[0.00]
HS information asymmetry component	0.118%	0.128%	0.064%	0.076%	0.052%	0.026%
Number of obs. (unbalance panel)	401	773	1111	2131	3268	6484

*, **, *** indicate two tailed statistical significance at the 10%, 5% and 1% levels, respectively.

6.3.2. *Does information asymmetry explain post earnings announcements drifts?*

As discussed in chapter II, over the four decades literature documented that stock prices drift after the earnings news, and the size of earnings surprises are directly related to the size of drift. Ng et al (2008) reported that size of PEAD is related to size of earnings surprise, stock volatility and transaction cost.. The initial part of this chapter 6. 2. 3 following Ng et al (2008) approach presents that there are strong evidences of the relationship between price drift and earnings surprises, stock liquidity, and stock volatility. To explore the role of information asymmetry cost component in bid ask spread, in this section I perform another panel estimated general least squared regression as follows:

$$Market\ respone = CAR^{i}_{0,k} \qquad (6.3.2.1)$$

$$= \beta_0 + \beta_1 UE_{i,0} + \beta_2 UE_{i,0} News_{i,k} + \beta_3 UE_{i,0} Volatility^{i}_{-90,-21} + \varepsilon_i$$

Where,

[72] 180 days which includes 90 days before earnings announcement and 90 days after earnings announcement

Market response is cumulative abnormal return of stock i from event day 0 to day k.

$UE_{i,0}$ is earnings surprise on the event day 0.

News is the average adverse selection or information asymmetry component of stock i's effective bid ask spread, from event day to day k, calculated based on Huang and Stoll (1997) model, presented in tables shown in above section 6.3.1. It is calculated as the percentage of effective spread time effective spread[73].

Volatility is the standard deviation of stock i during 70 days pre-earnings announcement, from day -90 to day -21.

ε_i is error term.

Results are presented from table 6.3.2.1 to table 6.3.2.8.

This model uses panel estimated general least squared method. Its characteristics are almost similar as the model 6.2.2.1, except the two facts that i) *Illiquidity* variable was replaced by *news*; which is the information asymmetry component of the bid ask spread inferred from section 6. 3.1 and ii) news are allowed to vary over time instead of taking them as at the time of the event; i.e. news are associated with variation in event window length. By allowing news lengthening the post event window we capture more changes in the earnings related news. We are mainly concern with β_1, the coefficient on the earngings surprise main effect, and β_2, the interaction term between earnings surprise and news. The equation 6.3.2.1 can also be rewritten as:

$$Market\ respone = CAR_{0,k}^{i} = \beta_0 + \beta_1^{'} UE_{0,i} + \varepsilon_i \qquad (6.3.2.2)$$

In which $$\beta_1^{'} = \beta_1 + \beta_2 News_{i,k} + \beta_3 Volatility_{-90,-21}^{i} \qquad (6.3.2.3)$$

To evaluate the impact of news on the PEAD, we are mainly concerned with β_2 the coefficient of the interaction between earnings surprise and news.

The results are presented from table 6.3.2.1 to 6.3.2.8. Overall, the results for the UK and French equity markets are consistent with hypothesis that firms with higher information asymmetry costs have higher market response. The interaction between information variable and earnings surprises are significant in the UK and French,

[73] All results are qualitative unchanged when using the percentage of the effective spread due to adverse selection rather than multiplying this variable by effective spread.

however there are mixed results between positive and negative in the US markets, showing that the impact of information asymmetry component in this market is unclear. This might be due to the bias in the earnings measurement method or unkown market conditions. As mentioned before, at least we do not have specific time of earnings release for firms in the US. The weak results from the US stock markets could be a function of a measurement error in the unexpected earnings/earnings surprise.

As expected, earnings surprise main effects are positive and significant in the UK; however earnings surprise main effects are not clear in France. The main effects of earnings surprise in the US are strong for NASDAQ100 and S&P 100 but not quite strong for DJIA in the US.

Table 6.3.2.1 FTSE100 Market response to earnings announcement and information asymmetry cost.

This table presents the results of earnings response coefficient regression to examine the market reaction to earnings news for different time frames. The dependent variable is cumulative abnormal return of each counter period [0, 10]; [0, 20]; [0, 30]; [0, 60]; [0, 90] after the earnings announcement. Surprise is earnings surprise measured as unexpected earning on the event day $UE_{i,0}$ with the indices that have the abnormal returns and trading volume reach its peak on day 1 surprise will be earnings surprise measured as unexpected earnings on day 1, due to many companies releasing information at the market close, led to the largest reaction happening on day 1.News is the information asymmetry component in the bid ask spread infer from Huang and Stoll (1997) spread decomposition model, Volatility is standard deviation of stock return pre-earnings announcement during the period [-90,-20]. This panel fixed effect regression uses General Least Square method.

Window Period after earnings announcement	**10days**	**20days**	**30days**	**60days**	**90days**
Constant	0.0004	0.003***	0.005***	0.012***	0.017***
	[0.42]	[0.00]	[0.00]	[0.00]	[0.00]
UE_0	0.740***	0.738***	0.562***	0.115**	-0.147***
	[0.00]	[0.00]	[0.00]	[0.02]	[0.00]
$UE_{i,0} * News$	0.021***	0.035***	0.040***	0.053***	0.071***
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
$UE_{i,0} * Volatility$	17.750***	13.643***	21.533***	50.442***	67.449***
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
R^2	0.89	0.76	0.63	0.48	0.33
Number of Observation	1072	2039	2969	5809	8689

*, **, *** indicate two tailed statistical significance at the 10%, 5% and 1% levels, respectively.

In table 6.3.2.1, the interaction term between earnings surprise and news is positive and significant, showing that the variation in news interact with earning surprise can explain the change in stock reaction after earnings announcement. Other variable coefficients such as that of earnings surprise and the interactions term between earnings surprise and stock volatility are positive and significant in different event window lengths. The main effect of earning surprise in FTSE100 is small compared to other indices. As expected, main effect of earnings surprise reduces over time.

In table 6.3.2.2, the interaction terms between earnings surprise and news are positively significant, showing that the variation in news interact with earning surprise can explaine the change in stock reaction after earnings announcement. Other variables, earnings surprise main effect coefficient is positive and significant in different event window lengths until the end of period of 90 days post earnings announcement. The interaction terms between earnings surprise and stock volatility are negative and significant. Earnings surprise main effects are larger than in the case of FTSE100.

Table 6.3.2.2 FTSE 250 Market response to earnings announcement and information asymmetry cost.

This table presents the results of earnings response coefficient regression to examine the market reaction to earnings news for different event time frames. The dependent variable is cumulative abnormal return of each counter period [0, 10]; [0, 20]; [0, 30]; [0, 60]; [0, 90] after earnings announcement. Surprise is earnings surprise measured as unexpected earning on the event day $UE_{i,0}$ with the indices that have the abnormal returns and trading volume reach its peak on day 1 surprise will be earnings surprise measured as unexpected earnings on day 1, due to many companies releasing information at the market close, led to the largest reaction happening on day 1.News is the information asymmetry component in the bid ask spread infer from Huang and Stoll (1997) spread decomposition model, Volatility is standard deviation of stock return pre-earnings announcement during the period [-90,-20]. This panel fixed effect regression uses General Least Square method.

Window Period after earnings announcement	**10days**	**20days**	**30days**	**60days**	**90days**
Constant	0.004***	0.005***	0.005***	0.007***	0.008***
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
UE_0	1.280***	1.392***	1.442***	1.395***	1.199***
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
$UE_{i,0} * News$	0.005***	0.005***	0.006***	0.012***	0.009***
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
$UE_{i,0} * Volatility$	-14.670***	-19.191***	-21.523***	-21.669***	-12.617***
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
R^2	0.76	0.71	0.64	0.51	0.36
Number of Observation	2528	4782	6893	13589	20430

*, **, *** indicate two tailed statistical significance at the 10%, 5% and 1% levels, respectively.

In table 6.3.2.3, the interaction terms between earnings surprise and news are negative and significant, showing that the variation in news when interacts with earnings surprise can explain the change in stock reaction after earnings announcement. Earnings surprise main effects and interaction with volatility is significant in different event window lengths. Earnings surprise main effects are larger compared to FTSE100 and FTSE250.

Table 6.3.2.3FTSE Small Cap - Market response to earnings announcement and information asymmetry cost.

This table presents the results of earnings response coefficient regression to examine the market reaction to earnings news for different window periods. The dependent variable is cumulative abnormal return of each counter period [0, 10]; [0, 20]; [0, 30]; [0, 60]; [0, 90] after earnings announcement. Surprise is earnings surprise measured as unexpected earning on the event day $UE_{i,0}$ with the indices that have the abnormal returns and trading volume reach it peak on day 1 surprise will be earnings surprise measured as unexpected earnings on the day 1, due to many companies releasing information at the market close, led to the largest reaction happen on day 1.News is the information asymmetry component in the bid ask spread infer from Huang and Stoll (1997) spread decomposition model, Volatility is standard deviation of stock return pre-earnings announcement during the period [-90,-20]. This panel fixed effect regression uses General Least Square method.

Window Period after earnings announcement	10days	20days	30days	60days	90days
Constant	0.003***	0.003***	0.004***	0.003***	0.002***
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
$\boldsymbol{UE_0}$	1.268***	1.414***	1.434***	1.590***	1.656***
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
$\boldsymbol{UE_{i,0} * News}$	-0.002***	-0.003***	-0.004***	-0.004***	-0.004***
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
$\boldsymbol{UE_{i,0} * Volatility}$	-5.224***	-8.885***	-8.418***	-10.336***	-12.424***
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
$\boldsymbol{R^2}$	0.75	0.64	0.56	0.47	0.39
Number of Observation	3299	6267	9128	17985	27019

*, **, *** Indicate two-tailed statistical significance at the 10%, 5% and 1% levels, respectively.

The interaction terms between earnings surprise and news in the table 6.3.2.4 are positive and significant in this table 6.3.2.4, showing that the variation in news interacts with earnings surprise can be explained by the change in stock reaction after earnings announcement. The earnings surprise main effects are also higher than that of FTSE100, positive and significant over different window lengths. The interactions between earnings surprises and volatility are negative and significant.

In table 6.3.2.5, the interaction terms between earnings surprise and news are negative and significant over a 10 day window period, and positive and significant over a 60-day period; however over a 20, 30 and 90 day period, the interaction terms coefficients are insignificant. The results are mixed, providing that the variation in news do not explain for the market response after earnings announcement. Earnings

Table 6.3.2.4 FTSE AIM All Shares - Market response to earnings announcement and information asymmetry cost.

This table presents the results of earnings response coefficient regression to examine the market reaction to earnings news for different window periods. The dependent variable is cumulative abnormal return of each counter period [0, 10]; [0, 20]; [0, 30]; [0, 60]; [0, 90] after earnings announcement. Surprise is earnings surprise measured as unexpected earning on the event day $UE_{i,0}$ with the indices that have the abnormal returns and trading volume reach its peak on day 1 surprise will be earnings surprise measured as unexpected earnings on day 1, due to many companies releasing information at the market close, led to the largest reaction happening on day 1.News is the information asymmetry component in the bid ask spread infer from Huang and Stoll (1997) spread decomposition model, Volatility is standard deviation of stock return pre-earnings announcement during the period [-90,-20]. This panel fixed effect regression uses General Least Square method.

Window Period after EA	**10days**	**20days**	**30days**	**60days**	**90days**
Constant	0.002***	0.003***	0.006***	0.012***	0.017***
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
UE_0	1.229***	1.297***	1.361***	1.475***	1.510***
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
$UE_{i,0} * News$	0.001**	0.006**	0.012***	0.017***	0.014***
	[0.04	[0.03]	[0.00]	[0.00]	[0.00]
$UE_{i,0} * Volatility$	-4.124***	-5.177***	-6.361***	-8.461***	-9.008***
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
R^2	0.85	0.73	0.66	0.48	0.40
Number of Observation	9656	18275	26915	53113	79474

*, **, *** Indicate two-tailed statistical significance at the 10%, 5% and 1% levels, respectively

Table 6.3.2.5 DJIA

This table presents the results of earnings response coefficient regression to examine the market reaction to earnings news for different window periods. The dependent variable is cumulative abnormal return of each counter period [0, 10]; [0, 20]; [0, 30]; [0, 60]; [0, 90] after earnings announcement. Surprise is earnings surprise measured as unexpected earning on the event day $UE_{i,0}$ with the indices that have the abnormal returns and trading volume reach its peak on day 1 surprise will be earnings surprise measured as unexpected earnings on day 1, due to many companies releasing information at the market close, led to the largest reaction happen on day 1.News is the information asymmetry component in the bid ask spread infer from Huang and Stoll (1997) spread decomposition model, Volatility is standard deviation of stock return pre-earnings announcement during the period [-90,-20]. This panel fixed effect regression uses General Least Square method.

Window Period after EA	**10days**	**20days**	**30days**	**60days**	**90days**
Constant	0.0001	-0.002***	-0.001	0.001	0.004***
	0.76	0.00	0.15	0.19	0.00
UE_0	1.273***	1.006***	0.500***	-0.490***	-0.751***
	[0.00]	0.00	0.00	0.00	0.00
$UE_{i,0} * News$	-0.195*	0.201	0.447	1.067*	-0.666
	0.07	0.63	0.34	0.09	0.43
$UE_{i,0} * Volatility$	-5.460	13.895	65.409***	156.465***	166.255***
	0.49	0.15	0.00	0.00	0.00
R^2	0.83	0.70	0.62	0.47	0.28
Number of Observation	326	610	901	1769	2643

*, **, *** Indicate two-tailed statistical significance at the 10%, 5% and 1% levels, respectively

news main effect and interaction between earnings news and volatility also have mix results. This could be due to the bias in the earnings surprise measurement in the US markets.The results provide no evidence that information asymentry cost component can explain the PEAD in this sub set of sample.

As presented in table 6.3.2.6, main effect of earnings surprises are positive and significant, however, the interaction terms between news and earning surprise in this regression output are not significant for most event window periods, providing no evidence that information asymmetry cost component can explain the variation in market response after earnings announcement. The interaction terms between earnings surprise and volatility also have mixed reults. We found no evidence that information asymmetry cost component can explain the PEAD in NASDAQ100. Again, the errors in earnings supprises measurement have not been taken into account.

Table 6.3.2.6 NASDAQ100

This table presents the results of earnings response coefficient regression to examine the market reaction to earnings news for different window periods. The dependent variable is cumulative abnormal return of each counter period [0, 10]; [0, 20]; [0, 30]; [0, 60]; [0, 90] after earnings announcement. Surprise is earnings surprise measured as unexpected earning on the event day $UE_{i,0}$ with the indices that have the abnormal returns and trading volume reach its peak on day 1 surprise will be earnings surprise measured as unexpected earnings on day 1, due to many companies releasing information at the market close, led to the largest reaction happening on day 1.News is the information asymmetry component in the bid ask spread infer from Huang and Stoll (1997) spread decomposition model, Volatility is standard deviation of stock return pre-earnings announcement during the period [-90,-20]. This panel fixed effect regression uses General Least Square method.

Window Period after earnings announcement	**10days**	**20days**	**30days**	**60days**	**90days**
Constant	0.001	-0.002***	-0.002***	-0.006***	-0.007***
	0.16	0.01	0.00	0.00	0.00
UE_0	1.073***	1.254***	1.299***	1.159***	0.519***
	0.00	0.00	0.00	0.00	0.00
$UE_{i,0} * News$	-0.234	-0.248	-0.099	0.206	1.275***
	0.39	0.33	0.71	0.34	0.00
$UE_{i,0} * Volatility$	5.793***	-3.064*	-6.183***	1.956	29.652***
	0.00	0.09	0.00	0.33	0.00
R^2	0.81	0.70	0.62	0.46	0.25
Number of Observation	1029	1953	2878	5669	8454

*, **, *** Indicate two-tailed statistical significance at the 10%, 5% and 1% levels, respectively

Table 6.3.2.7 shows that main effects of earnings surprise are positive and significant; the interactions between earnings surprise and volatility are also positive and significant; however, the coefficient of interaction terms between news and earning surprise are insignificant, providing that the interaction between information asymmetry cost component and earnings surprise cannot explain the variation in the market response to earnings announcement.

Table 6.3.2.7 S&P100

This table presents the results of earnings response coefficient regression to examine the market reaction to earnings news for different window periods. The dependent variable is cumulative abnormal return of each counter period [0, 10]; [0, 20]; [0, 30]; [0, 60]; [0, 90] after earnings announcement. Surprise is earnings surprise measured as unexpected earning on the event day $UE_{i,0}$ with the indices that have the abnormal returns and trading volume reach its peak on day 1 surprise will be earnings surprise measured as unexpected earnings on day 1, due to many companies releasing information at the market close, led to the largest reaction happening on day 1.News is the information asymmetry component in the bid ask spread infer from Huang and Stoll (1997) spread decomposition model, Volatility is standard deviation of stock return pre-earnings announcement during the period [-90,-20]. This panel fixed effect regression uses General Least Square method.

Window Period after earnings announcement	**10days**	**20days**	**30days**	**60days**	**90days**
Constant	0.002***	0.004***	0.007***	0.011***	0.016***
	0.00	0.00	0.00	0.00	0.00
UE_0	0.825***	0.797***	0.764***	0.569***	0.155**
	0.00	0.00	0.00	0.00	0.02
$UE_{i,0} * News$	0.022	0.093	1.44	0.362	0.159
	0.46	0.29	0.13	0.16	0.40
$UE_{i,0} * Volatility$	21.658***	18.653***	22.141***	32.961***	56.360***
	0.00	0.00	0.00	0.00	0.00
R^2	0.74	0.64	0.56	0.37	0.21
Number of Observation	1078	2020	2989	5894	8799

*, **, *** Indicate two-tailed statistical significance at the 10%, 5% and 1% levels, respectively

Table 6.3.2.8 shows a significant positive relationship between the interaction term and dependent variable, providing that the variation between information asymmetry components could provide explanation to the variation in the market response to earnings news. However, the single effects of earnings surprise are not clear in 20-day and 90-day window lengths. The situation in the French suit to the fact that France is a code law accounting system, where earnings news are released to the markets through different channel before the official earnings announcement. The uncertainty therefore has been digested in a longer time and since pre-earnings announcemet period. As mentioned in chapter III in data selection process, the event day for French market is defined not by the date of the official earnings announcement but the day of the first unofficial release of even partial news regarding the earnings of a firm. The possibility of partitially implies that the different reaction of the French market to the arrival of earnings news compared to the US and the UK markets may be a statistical artefact caused by the definition of event date. In the other words it might be possible that if the French market received full information on the event day it might well react in the same way as the UK and the US market. This implies not only for the cumulative abnormal returns behaviour in chapter 4.2.2.8 but also shown in this part.

The interaction between earnings surprise and volatility in French are positive and significant.

Table 6.3.2.8 CAC40

This table presents the results of earnings response coefficient regression to examine the market reaction to earnings news for different window periods. The dependent variable is cumulative abnormal return of each counter period [0, 10]; [0, 20]; [0, 30]; [0, 60]; [0, 90] after earnings announcement. Surprise is earnings surprise measured as unexpected earning on the event day $UE_{i,0}$ with the indices that have the abnormal returns and trading volume reach its peak on day 1 surprise will be earnings surprise measured as unexpected earnings on day 1, due to many companies releasing information at the market close, led to the largest reaction happening on day 1.News is the information asymmetry component in the bid ask spread infer from Huang and Stoll (1997) spread decomposition model, Volatility is standard deviation of stock return pre-earnings announcement during the period [-90,-20]. This panel fixed effect regression uses General Least Square method.

Window Period after earnings announcement	**10days**	**20days**	**30days**	**60days**	**90days**
Constant	0.001***	0.004***	0.005***	0.005***	0.005***
	0.00	0.00	0.00	0.00	0.00
UE_0	0.333***	0.078	0.331***	-0.713***	-0.642
	0.02	0.41	0.00	0.00	0.00
$UE_{i,0} * News$	-1.392**	0.489**	1.749***	1.564***	0.930***
	0.02	0.04	0.00	0.00	0.00
$UE_{i,0} * Volatility$	62.634***	75.348***	58.788***	156.534***	143.671***
	0.00	0.00	0.00	0.00	0.00
R^2	0.78	0.71	0.58	0.52	0.38
Number of Observation	440	835	1207	2333	3526

*, **, *** Indicate two-tailed statistical significance at the 10%, 5% and 1% levels, respectively

6.4 Summary

This chapter explores the role of information asymmetry cost component in the cause of price drift. This chapter has employed three main regressions. The first regression is a cross-sectional regression to examine how the market responds to the earnings news. First of all, the cumulative abnormal returns are regressed on the earnings surprise at the event time, and the interaction between earnings surprise at event time and stock liquidity at the event time. Regression output shows that earnings surprise main effects are positive and highly significant in the whole period of 90 days in London Stock Exchange, Paris Bourse, and the NASDAQ100. Earnings surprise main effects are also positive and highly significant in the US market during a period of up to 30 days. After 60days the reactions are insignificant or become negative in the end. The interaction terms between earnings surprise and stock liquidity are positive and highly significant for two large stock indices in the London Stock Exchange FTSE100 and FTSE 250. This interaction is unclear and mixed for the other two small and illiquid indices FTSE Small Cap and FTSE AIM All Shares and the US and French Equity markets. The following regression based on Huang and Stoll (1997) effective spread decomposition model. Huang and Stoll (1997) model directly infer information asymmetry cost component (and cost of trading component) in effective spread, that decreased in percentage over time in FTSE100 and FTSE 250, and more or less kept at the same percentage for other indices. In an attempt to establish the relationship between information asymmetry component and market response, the final regression is a panel fixed effect regression, based on the first regression approach. This regression allows information component to vary by time. This regression examines whether the information component in liquidity play a role in explaining the PEAD. The results from this regression reveal that information asymmetry cost component in the bid ask spread account for post earnings announcement drift in all the four indices in London Stock Exchange and for the CAC40 in French market. However, there is very less statistical evidence that information asymmetry cost component have relationship with post earnings announcement drift in the US market. This problem might be due to the earnings surprise measurement on the event as already stated above, that there are a number of firms which announce earnings results at the beginning of the market open, and the remainder release earnings information after market close. The reaction (earnings surprises variable) at the event time therefore is difficult to calculate accurately.

CHAPTER VII

CONCLUSSIONS AND REMARKS

Post Earnings Announcement Drift is an anomaly that is robust with a longest history in behavioural finance. Over the last four decades, there have been many attempts to solve the question what causes the PEAD, however, the main reason for it remains hidden in literature. Given the importance of a phenomenon that drives the investors' behaviours on their way to exploit benefits through PEAD, in this thesis I have addressed the three issues:

1) to evaluate the impacts of earnings news and the effects this has on stock liquidity
2) Answer the question: Can stock liquidity explain the Post Earnings Announcement Drift? i.e. PEAD.
3) Further to the above question particularly within the relationship between PEAD and stock liquidity, what is the role of information asymmetry cost? In other words what is the difference in behaviour demonstrated by informed and uninformed traders around the new earnings news?

Given the nature of data set that I collected[74], some shortcomings of other measures of stock liquidity that were presented in the chapter covering literature (Chapter II), and some of the advantages of bid ask spread, which were also presented in Chapter II, this thesis mainly uses three measures of bid ask spread to proxy for stock liquidity[75]. However, this thesis also spent the initial part of empirical analysis in Chapter IV to explore the liquidity effects through examining the price response and trading volume

[74] Data samples were already split into different indices, with similar firms' characteristics. There is no need to control for those factors such as firm size or book to market values etc.. See Chapter III- Data Selection and Methodology.

[75] Quote bid ask spread, relative bid ask spread, and effective bid ask spread, as defined in Chapter III.

impacts in order to provide the different dimensions analysis of the change in stock liquidity around the news.

The days of earnings announcement were collected with great care, in this study. The data sample of this thesis covers 1821 firms listed in different indices from London Stock Exchange, (including main and alternative investment markets), NASDAQ, CBOE, S&P and the Euronext Paris. Data samples were collected according to each individual index group with similar characteristics, i.e. factors such as firm size, book to market values … are all considered the same in each index when performing analysis. This assumes that there are no cross-sectional variations across firms within one index.

Within the framework of this thesis, not only the highly liquid but also less liquid and illiquid stocks in the London Stock Exchange are being covered. Moreover, this thesis makes a comparison between common law accounting countries (US, and UK) and code law accounting country (France). With different characteristics of the two types of accounting systems, earnings news should play different roles, the reason being that in the common law system earnings news is released at the announcement date whilst in the code law system, earnings news is conveyed to the market up to 3-4 weeks in advance of the earnings announcement through various channels. However, it is interesting that in this thesis I have observed almost the same types of reactions on the event in both systems: The strongest reaction happened on event day [0] and then gradually reduced over time even in the code law country as France. The differences are: firstly, there is evidence of pre-earnings announcement drift in the code law system; secondly, in the code law system the cost of trading component dominates the bid ask spread/stock illiquidity while in the common law system the information asymmetry component dominates the bid ask spread/stock illiquidity.

This thesis has also observed that when the news is released, investors react by trading more with both liquid and illiquid stocks, however, when the news ceases, investors tend to follow the larger stock and few investors follow small/ illiquid stocks.

Chapter IV which was based on univariate analysis explores the impact of earnings announcement on stock liquidity in different short term and long term scenarios. The analysis is conducted over a period of 90 days prior to actual earnings announcement and 90 days after earnings announcement date, based on a sample of 1555 ordinary common stocks from 4 indices in the London Stock Exchange, 226 stocks from three main indices in the United States, and 40 major stocks from Euronext Paris that have data available on DATASTREAM ADVANCE. Three separate methodologies were employed in this chapter: the market adjusted model of stock returns following traditional event study, the trading volume effect analysis using the approach of Hedge and Mc DerMott (2003) and Gregoriou and Ioannidis (2006); and finally the application of Information Cost Liquidity Hypothesis established by Van Horne (1970), subsequently followed by a number of authors such as Beinesh and Gardner 1995, Hedge and McDermott 2003, and Gregoriou and Ioannidis (2006).

The empirical results in Chapter IV which begin with traditional market adjusted model show that there are strong reactions of stock prices after earnings announcement over all in the three countries and respective markets, that employ the usage of either the common law system (UK and US), where earnings information is released on the announcement date, or the code law system as in France where earnings information is leaked through various channels before the official announcement date. The results from this particular part of analysis show that, a code law system such as in France, the pre-earnings announcement reaction is very clear. This happened as we would expect, when the earnings news is conveyed to the markets. In the common law systems such as the US and UK, we do see some evidences of pre-earnings announcement reaction, however this happens very close to the announcement date, as shown in figures from 4.1.1.1- 4.1.1.8.

Beside this, the strongest reaction happened in both systems (the US, UK and France) on the event day (0) or day (1) in some cases in the US. Note that in the US there are a number of companies that release earnings news in the morning before market open and a number of companies release earnings news in the afternoon after market close. Due to this fact, there is noise in the results between day 0 and day 1.

The level of reaction was still very strong in the short term window, however it reduced over time. Over the long-term period, we could see that good news reaction lasts much longer and bad news ceases more quickly for most indices except NASDAQ 100. For example in the London Stock Exchange, good news for FTSE 100, FTSE 250, FTSE Small cap and FTSE AIM All Shares all react up to the whole studied period of 90 days; in the US, DJIA up to 50 days, S&P100 up to the studied period of 90 days. As for bad news, in London Stock Exchange, FTSE 100 react up to

10 days, FTSE 250, FTSE small cap react within 5 days after earnings announcement, FTSE AIM All Shares react after 20 days; in the US, DJIA reacts within 5 days, S&P bad news reacts up to 10 days. The two cases that are different are the NASDAQ 100 and CAC 40. NASDAQ100 has a good news reaction lasting up to 20 days only whilst bad news reaction lasts up to 80 days. In France, the CAC 40 good news reacts up to 30 days and bad news reaction within 40 days.

The increases/decreases in price following earnings announcement are permanent. After the change has taken place, price does not go back down or up from the original levels as shown graphically and statistically.

Overall, there tends to be a greater willingness to discuss and promote a brighter future for the good news by firms, and it makes the price continue to drift up in the long term. Meanwhile on the psychological side, markets/investors tend to cease their reactions more quickly with bad or negative news except in the case for the NASDAQ . The fact that the NASDAQ contains 100 high tech firms could be an answer, more weight for the bad news than for good news, leads to longer reactions. In case of CAC 40 in France due to the fact that information is released and digested before the release date it is surprising that stocks still react very strongly on the earnings announcement day than before.

The analysis of the trading volume effect which was the second part of univariate analysis in chapter IV, partly confirmed another dimension of stock liquidity that is affected by earnings announcement. On the one hand, trading volume has a constant change and a slope coefficient change after earnings news is released. And on the other hand trading volume has a positive time trend. Both of these lead to the result that stocks being traded more frequently/easily following the earnings news.

In particular, the empirical analysis of this part shows that, in the short term within five days before the earnings announcement and five days after earnings announcement, there is a dramatic increase in trading volume for all indices. The impacts of the earnings news on trading volumes are most profound when the news is formerly released. The abnormal volume reaches its peak on the event day 0 in the London Stock Exchange and for DJIA, S&P100 in the US stock Exchange and CAC40 in Euronext Paris, on day 1 for NASDAQ100. The trading volumes are many times higher as compared to the change on day -10 in the additional test. See tables from 4.2.2.1 to 4.2.2.8, panel A for details. After the announcement date, the news continues to have an effect on trading volume. Trading volumes still increase; however the impact level is less aggressive and gradually decreases day by day. Results also show that, trading volume not only increases due to earnings announcement but also increases over time. Beside the impact of earnings news, this time factor (linear time trend) will also affect stock liquidity due to the speed of selling stocks is also indicated by volume. Generally when the volume increases, the cost of trading will reduce, hence it alone makes total bid ask spread decrease or in other words, stock liquidity improves.

In the long term, when compared to the whole post earnings announcement and pre earnings announcement periods[76], this thesis reports the increase in trading volume scaled by market value for all of the eight indices. See tables from 4.2.2.1 to 4.2.2.8, panel B. Using standard t test used to compare two sample mean values, the results suggest in the long term, trading volume still increases significantly for large and medium stocks (including FTSE100, FTSE250, DJIA, NASDAQ100, S&P100, AND CAC40), but not significantly for small stocks (FTSE Small Cap and FTSE AIM All Shares). The possible explanation is that when the news is released, people tend to trade more, however when the news ceases, traders are more likely to follow large stocks, less likely to follow small firms.

There is a common issue for above two parts. Evidence shows that both the *price* and *trading volume* reactions are very large and profound close to the event date, and gradually reduced over time.

Finally, the last part of univariate analysis in chapter IV shows that in the common law system such as the US and UK, stock liquidity will *decrease* due to the *immediate* impact of earnings announcement; however in the long term stock liquidity gradually improves over time due to the increase in trading volume effect. In the code law system as employed in France, evidence from the CAC 40 index clearly shows that the *immediate* impact on stock liquidity is *opposite* to that of the common law system. In the long term for the CAC 40, stock liquidly will follow the same trend as in the US and UK, continue to improve. However, the immediate decrease in stock liquidity in the UK and US after earnings announcement suggest that the information asymmetry

[76] Pre-earnings announcement period is defined as period from day -90 to day -1. Post earnings announcements period is defined as period from day 0 to day +90.

component dominates liquidity (bid ask spread) in the these two countries, meanwhile the immediate improvements to stock liquidity of the CAC 40 suggests that the cost of trading component (order processing and the inventory holding cost) dominates the bid ask spread in the French market.

In order to reach above conclusion, last part of chapter IV investigates if earnings announcement creates a new information environment and how earnings news affects stock liquidity in different markets. My expectation is for an improvement in the information environment; stocks should be traded more and become more liquid. This part of study however, shows that in post earnings announcement period, at first, bid ask spread increased (liquidity decreased) in the UK and the US markets. In the meantime, bid ask spread at first decreases (liquidity increased) in the French market. Why does this happen? As stated earlier that the bid ask spread can be decomposed in the information asymmetry component and cost of trading component, we can see that earnings news not only affects trading volume but also leads to the reduction in the cost of trading and increases the information asymmetry component in the bid ask spread. The reason for this is being that when the news is released, not every one can gain and digest the news in the same way. There will be investors who have advantages over other groups. Therefore, earnings news once released will create the gap between informed and uninformed traders. This gap is referred as information asymmetry component in the bid ask spread. When earnings news is released, this gap increases and it will make the total bid ask spread to increase.

Now we can see that, the overall impact of earnings news on the bid ask spread will be the total of the above two effects. If the increase in information asymmetry component is the leading factor, then the total bid ask spread will increase (stock liquidity decreases). However, if the decrease in cost of trading component is the leading factor, then the total bid ask spread will decrease (stock liquidity increases). And what happened on the London Stock Exchange and the US markets suggests that the information asymmetry component dominates bid ask spread (stock liquidity) in these two common law system based countries; what happened on the Euronext Paris market suggests that the cost of trading component dominated bid ask spread (stock liquidity) in the French market. This happened exactly as what was expected from a code law system country where earnings information is released through different channels before the earnings announcement date, and thus plays a less dominant role.

Another point to be noted from the results, even though stock liquidity decreases (bid ask spread increase) in the common law systems as employed by the US and UK, and stock liquidity increase (bid ask spread decrease) in the code law as in France for the studied period of 90 days post earnings announcement, what we can see is that over time, stock liquidity increased (bid ask spread decreases) in all the three markets the UK and the US and French. This evidence is shown in the gradual decrease in the bid ask spread ratios if we look at the different short window periods in tables from 4.3.1.1 to 4.3.1.8. This is explained by the reason that over time the information asymmetry in the news has less impact while trading volume has still increased due to the news and by its own time linear function, leading to the continuous improvement in liquidity. This issue was strongly supported by the results of Chapter V.

Chapter V performs a multivariate analysis of stock liquidity in the long term after earnings announcement. This multivariate analysis continues to prove and confirm the results in Chapter IV. In general, earnings announcements provide two directions of impact on stock liquidity. A part of stock liquidity will decrease immediately, proved by positive sign of intercept dummy variables in the multivariate regression[77], and is suggested that due to the information asymmetry increase during the announcement period (which are analysed in Chapter VI). The other part of stock liquidity will improve as the trading volume increases after earnings announcement. This is shown in the negative slope dummy coefficient of the interaction term between dummy variable and trading volume[78]. This conclusion is proven in most of the indices, except for a few cases in effective spread models where the sign of coefficient is insignificant.

From what we observed, in the long term there are two side impacts of earnings announcement on stock liquidity /bid ask spread. Earnings announcements increase bid ask spread (decrease stock liquidity) as we observed from significant positive intercept dummy variable coefficient $\beta 1$. Meanwhile at the same time, trading volume increases due to earnings announcement leading to the decrease in the bid ask spread

[77] The regression is with stock illiquidity (natural logarithm of bid ask spread) as dependent variable, hence the positive sign of intercept dummy means that there is an increase in stock *illiquidity* or a decrease in stock *liquidity* due to the event.

[78] The regression is with stock illiquidity (natural logarithm of bid ask spread) as dependent variable, hence the negative sign of slop coefficient of interact term means that there is a *negative* ship in the function of stock illiquidity or a *positive* ship in the function of stock liquidity.

(or improvement in stock liquidity) as we observed from the significant negative β3. The overall effect will be the total of both the above effects. This finding holds true in both univariate and multivariate analysis, and this also explains the results in the univariate analysis, particularly the results from information cost liquidity hypothesis application. In the short term, stock liquidity decreases (bid ask increases) due to immediate impacts of earnings announcement. Due to the increase in trading volume after earnings announcement, stock liquidity gradually increases (bid ask spread decreases) over time. This helps to explain both the situations that in common law system as the US and the UK, where the information asymmetry cost component dominates bid ask spread, and in the code law system as France, where the cost of trading (inventory holding and order processing cost components) dominates bid ask spread.

Lastly, chapter VI explores the role of information asymmetry cost component in the causes of price drift. This chapter employed three main regressions. The first regression is a cross-sectional regression to examine how the market responds to the earnings news. First of all, the cumulative abnormal returns are regressed on the (i) earnings surprise, (ii) the interaction between earnings surprise and stock liquidity, and (iii) the interaction between earnings surprise and stock volatility at the time of the event. Regression output shows that earnings surprise main effects are positive and highly significant in the whole period of 90 day in London Stock Exchange and Paris Bourse, and NASDAQ100. The main effects of earnings surprise are also positive and highly significant in the US market during period of up to 30 days. After 60days the reactions are insignificant or become negative in the end. The interaction period between earnings surprise and stock liquidity is positive and highly significant for the two large stock indices in the London Stock Exchange FTSE100 and FTSE 250. This interaction is unclear and mixed for the other two smaller and illiquid stock FTSE Small Cap and FTSE AIM All Shares and the US and French Equity markets.

The following regression is based on Huang and Stoll (1997) effective spread decomposition model. Huang and Stoll (1997) model directly infer information asymmetry cost component (and cost of trading component) in effective spread, which decreased in percentage by time in the FTSE100 and FTSE 250 and more or less remained at the same percentage level for other indices. In an attempt to establish a relationship between information asymmetry component and market response, the final regression is a panel fixed effect regression, based on the first regression approach. This regression allows information component to vary over time. This regression examines whether the information component in liquidity plays a role in explaining the PEAD. The results from this regression revealed that information asymmetry cost component in the bid ask spread partially account for post earnings announcement drift in all four indices in the London Stock Exchange and for the CAC40 in France. However, there is very little statistical evidence that information asymmetry cost component has a relationship with post earnings announcement drift in the US market. This problem might be due to the earnings surprise measurement of the event as already stated in the previous pages, that there are a number of firms announcing earnings results at the beginning of the market open, and the rest release earnings information after market has closed. The reaction occurs at the time of the event therefore is difficult to calculate correctly.

In the end, I conclude from this thesis that, although some cases do not apply however there is very strong evidence to show the association between earnings announcement and stock liquidity. The PEAD phenomenon therefore can be explained by the change in stock liquidity, the London Stock Exchange and French equity markets prove that the information component in stock liquidity can account for the change in post earnings announcement drift. The evidence from US market does not prove that conclusively but this may be due to the problem of measurement of earnings surprise.

Limitation and potentials for future research study

The objective of this research was to explore and demonstrate the relationship between the bid ask spread and PEAD, particularly the information asymmetry component in the bid ask spread and the PEAD. The conclusion drawn above is upon a number of certain assumptions. Hence, the following limitations are apparent and are recommened for further research:

- Statistical models of returns are derived purely from statistical assumptions about the behavior of returns -i.e., multivariate normality. Following the main stream in the literature, I have tested normality distribution of the cumulative abnormal returns to come to the conclusion that PEAD does exist, however in reality, normality might be incorrect, the distribution could be an other type of distribution such as chi-squared or bell shape etc..

- The earnings surprise measurement might not be accurate as demonstrated in chapter VI. This may be due to some unforeseen bias and assumptions made for earnings surprise. In addition, the specific time for earnings news release on the day in the US and French markets are not captured but may have a bearing and by virtue the results may be biased because of this fact. A further study would be recommended for specific release time and intraday data.
- From the Markets model, market adjusted model or CAPM/APT literature; we know that what drives expected stock returns is not exactly clear. Using cumulative abnormal return based on any of those models to proxy for PEAD may not be accurate over the long term as over the long period of time the bias will leave an accumulative effect. In long horizon studies, the specification of expected returns makes a huge difference, because small errors are cumulated. There is still no easy way out of this problem.

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